DEPARTMENT OF AGRICULTURE.

BULLETIN No. 34.

PRELIMINARY REPORTS

OF THE

SECRETARY OF AGRICULTURE,
DEPUTY SECRETARY OF AGRICULTURE,
ECONOMIC ZOOLOGIST,
COMMISSIONER OF FORESTRY,
DAIRY AND FOOD COMMISSIONER,
STATE VETERINARIAN,
FOR 1897.

PUBLISHED BY DIRECTION OF THE SECRETARY.

WM. STANLEY RAY,
STATE PRINTER OF PENNSYLVANIA.
1898.

OFFICIAL LIST.

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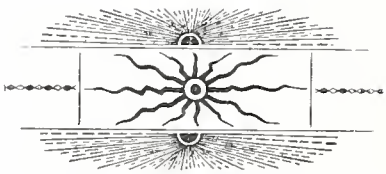


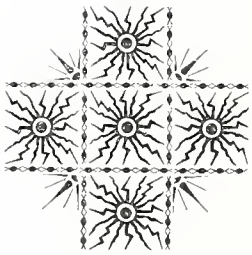
LETTER OF TRANSMITTAL.

COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF AGRICULTURE,
HARRISBURG, PA., January 1, 1898.

HON. DANIEL H. HASTINGS, GOVERNOR,

DEAR SIR: In compliance with the requirements of sections second and sixth of the act of March 13, 1895, I have the honor to herewith present the third annual report of the Department of Agriculture, and in so doing would take the opportunity to acknowledge with sincere gratitude the hearty co-operation which I have received from yourself and from the heads and officers of the various divisions over which you have assigned me control, and remain,

Very respectfully,
THOS. J. EDGE,
Secretary.



REPORT OF THE SECRETARY.

GENERAL WORK OF THE DEPARTMENT.

The past year has been one of advance all along the line of the work falling under the care of the Department, and, except possibly in a few minor instances, we find the work in advance of its position at the same time one year ago. The efficiency of the farmers' institutes has been increased by the additional amount appropriated for this purpose by the Legislature; the work of the Dairy and Food Commissioner has been extended by the passage of acts relating to cheese, vinegar and preservalines; the Forestry Commissioner has been strengthened by a special appropriation which will enable him to more efficiently carry on the duties imposed by the act of March 13th, 1895; the State Veterinarian, through the State Live Stock Sanitary Board, has been enabled to not only increase the efficiency of his work, but to also greatly extend its scope and usefulness by a special appropriation for an investigation into the preventable diseases of animals, and also by the authority given by the Legislature to exercise control over milk cows and breeding animals brought into our State, and to thus shut out diseased animals which ultimately would prove, under our existing laws, a burden and an imposition upon the Live Stock Sanitary Board.

The results and effects of the different acts which the Legislature of 1897 placed upon our statute books, and the proposed manner of carrying them into effect, will be distinctively noticed in their appropriate places in this report, and I need only here allude to them by the statement that, in effect, this additional legislation has about doubled the duties of the Dairy and Food Commissioner without any increase in the amount of funds accorded to him for expenses.

An item of great importance in the work of the Department, which is made more evident each year, is its educational feature as is shown by the correspondence of the officers and by the advanced ideas and views as noticed at our farmers' institutes, and I regard this as among the most important work, and the results achieved during the past year are of the most encouraging character.

Our farmers much better understand the intent and object of the Department and its officers, and are rapidly realizing that in it they have a department essentially their own and for their own benefit, and that if they do not receive the full measure of this benefit, the fault is their own, and does not revert to the Department or its officers.

Every division of the Department has a work to perform which, when properly appreciated by our farmers, will more than repay the cost of all of the divisions. Thus the work of the analyses of commercial fertilizers much more than repays the whole cost of the Department; the benefits obtained from farmers' institutes, especially in localities where they are properly understood and taken advantage of, more than repays the total expenses incurred in supporting the Department; the benefits gained by the work of the State Live Stock Sanitary Board, who, with the exception of the Governor, are all officers of the Department, in its work of suppressing tuberculosis, glanders and other contagious diseases, has been the means of saving live stock of much more value than the entire cost of the Department, and the work of the Forestry Division, in educating the people of the State and members of the Legislature which rendered the forestry legislation of the last session possible, will also more than repay the outlays on account of all of the work accomplished by the Department during the year.

The general correspondence of the Department has been greatly increased during the past year, and its value as a source of information to farmers thereby greatly extended. The Secretary has, so far as possible, retained this feature with his special care and, while all matters specifically related to the sub-divisions have been referred to their heads, yet the correspondence of a strictly general nature has been large, and it is believed that in this manner we have been able to confer lasting benefits upon the farmers of the State.

During the twenty-one years in which this correspondence has been under my care, a gradual and healthy change has taken place in its character, a change which clearly shows that our farmers are thinking more for themselves and depending less upon what is told them by those who too often have other interests more deeply at heart than those of the people whom they claim to represent.

We find that our farmers, largely through the avenues opened up to them by the Department of Agriculture and the Experiment Station, are doing more progressive thinking and acting than at any time during the past two or three decades and it is believed that, as the work of the Department progresses, this education will make itself increasingly felt, and that corresponding benefits will accrue which will show the wisdom of the act creating this department of the State Government for the benefit of the farmer.

FARMERS' INSTITUTES.

In 1859, the Massachusetts State Board of Agriculture appointed a committee "to consider and report upon the propriety of institute meetings similar to teachers' institutes;" this appears, so far as can be ascertained from existing records, the origin of the movement for farmers' institutes in the United States.

During the same year the committee reported strongly in favor of the proposed institutes, but no definite action appears to have been taken until 1871, when the committee recommended that all agricultural societies having representatives in the Board should "be requested to organize an annual meeting for lectures and discussions." In February, 1878, the Massachusetts Board of Agriculture held a series of three meetings, which were known as "farmers' institutes of Massachusetts;" in 1880 the Secretary of the Board was directed to "attend as many farmers' institutes as the other duties of his office would permit." In 1889, the Massachusetts board made it obligatory upon every society having a representative in its membership, to hold institutes, and in 1880 the reports show that 36 societies represented in the board had held 129 institutes.

In 1861, authority was given the Michigan Board of Agriculture to "institute a winter course of lectures for others than students of the State Agricultural College, under necessary rules and regulations," and its is claimed by some that these were in reality the first farmers' institutes held in the United States.

In 1869, it appears from the reports that, supported by local contributions, Profs. Welsh, Roberts and Bessy, assisted by Mrs. Tupper, held farmers' institutes in Iowa, and the report of 1871 contains a full account of the proceedings of these institutes.

In 1842, the New York State Agricultural Society instituted a course of winter meetings which, in many respects, resembled farmers' institutes of the present day, and, six years later, the society, by unanimous vote, resolved to continue them.

An examination into the history of the movement for farmers' institutes in Pennsylvania shows that much confusion has existed as to the difference between meetings of the farmers' clubs and the farmers' institutes of the present day, and authorities vary greatly in their views upon the question, but a majority agree that the main difference is that the meetings of the farm clubs are supported from private sources, while the expenses of the farmers' institutes are paid by the State.

If we accept this definition, and I find no better point at which to draw the dividing line, it follows that the first Pennsylvania farmers'

institute was held by the State Board of Agriculture, May 22d, 1877, and that this body has annually maintained them up to the transfer of the work to the Department of Agriculture, in 1895.

From May 22d, 1877, to June 22d, 1885, the Board of Agriculture maintained its farmers' institutes, necessarily limited in number, from its funds for general purposes, but, their value having been demonstrated to the satisfaction of all concerned, the Legislature, in 1885, made a specific appropriation of $1,000 per year, for two years, "for the actual and necessary expenses of conducting local farmers' institutes," and this may be justly claimed as the primary appropriation directly for this purpose. Since the latter date annual appropriations have been made to the Board of Agriculture as follows:

1885-6,	$1,000
1886-7,	1,000
1887-8,	3,000
1888-9,	3,000
1889-0,	5,000
1890-1,	5,000
1891-2,	7,000
1892-3,	7,000
1893-4,	9,500
1894-5,	9,500

These appropriations were expended by the Board in holding institutes as shown by the following table:

1885-6, 13 institutes,	23 days.
1886-7, 18 institutes,	30 days.
1887-8, 46 institutes,	81 days.
1888-9, 54 institutes,	96 days.
1889-0, 82 institutes,	144 days.
1890-1, 69 institutes,	121 days.
1891-2, 84 institutes,	166 days.
1892-3, 85 institutes,	168 days.
1893-4, 139 institutes,	258 days.
1894-5, 110 institutes,	205 days.

From June 1st, 1895, until the present time, the Legislature has made the following appropriations to the Department of Agriculture for the specific purpose of holding farmers' institutes:

1895-6,	$7,500
1896-7,	7,500
1897-8,	12,500
1898-9,	12,500

These appropriations having been made for periods of two years, we can, in considering the results, only reach conclusions by taking the two years' work as a whole and considering it as for one period, and, inasmuch as the second period of two years under the management of the Department has but fairly commenced, we can only judge its results by the work as outlined by Prof. Hamilton, in his Institute Bulletin for the past autumn.

For the period from June 1, 1895, to May 31, 1897, (two years), Prof. Hamilton reports that the amount of the appropriation, $15,000, was divided between the local expenses and the State lecturers in the proportion of $6,891.93 to the local managers for local expenses and $8,108.07 to State lecturers and for other expenses of management. The report also shows that during this time 572 days of institutes were held, the actual expenses of which were $26.00 per day, of which $12.00 per day was used for local expenses, and $14.00 per day for State lecturers and other similar expenses not local.

The experience of the Department having been that, previous to this year, its institute season had commenced too early in the fall and continued too late in the spring to secure the maximum of attendance, Prof. Hamilton decided to increase the number of institute corps from three to four, and to so arrange dates that the present season should commence November 29, 1897, and end March 8, 1898.

In order to make the holding of these institutes practicable, the force has been correspondingly increased and strengthened in various ways, until it is now believed that our State has one of the most thorough and practical corps of institute workers in the United States.

During previous seasons a portion of the appropriation has been set aside for the use of local managers for the payment of strictly local expenses, such as hall rent, advertising, board and expenses of local speakers, etc. During the season of 1896-7 this amount was $9.00 for each day of institute held. The experience of the last season having proven that this amount could be profitably increased, the sum of $12.50 per day of institute has been set aside for the local expenses.

In his official bulletin of institute information, Prof. Hamilton thus alludes to the mode of apportioning the funds among the different counties, and also among the different local institute managers:

"The apportionment shows the number of days that the Department will furnish two lecturers in each county for institute work during the season of 1897-8. It is made on the basis of two days to every county having not over 1,000 farms; three days of institute to every county having more than 1,000 farms and not over 1,500, and afterwards one day for each 1,500 farms, or fraction thereof, additional. This secures Department aid in each county in proportion to its agricultural interests.

"The amount of money to be distributed to the various managers for

local purposes, will be according to the number of days of institutes held. In order to make the amount ample for the coming season, the sum has been increased to $12.50 per day of institute. This provides $25.00 for each two days of institute, to be used for local expenses, and there will be, in addition, the State aid of at least two lecturers which, with the local assistance, ought to carry the work through in a creditable manner."

In some neighborhoods we find that owing to the existence of farm clubs and granges, the farmers of the locality are competent to organize and carry on independent institutes or farmers' meetings without the aid of the Department and its force. It has been our desire to encourage this condition as much as possible, and I am strongly of the opinion that such clubs should be formed in all strong agricultural centres, and the Department relieved from institute duty there in order that its influence and assistance may be extended in other districts in which they are more needed, and where farmers are less in the habit of meeting together for the discussion of agricultural topics.

When managing the institutes under the care of the Board of Agriculture, it was always my rule to encourage the formation of permanent organizations having for their object the holding of regular meetings for the consideration of questions best suited to the interests of the farmers of that locality, and I fully believe that such clubs or organizations may profitably be established in every agricultural community in the State. In districts in which strong and active granges or alliances already exist, they will and do serve as the nucleus around which the agricultural interests of the neighborhood may gather, and where such organizations do not exist, they should be formed, and it will, at all times be a pleasure to the officers of the Department to assist in the establishment and maintenance of organizations of this character, and it will also be considered the duty of the Department, when it is possible, to extend assistance, in the form of speakers, to such meetings.

It is noticed that in many districts there is too strong a disposition to depend upon State speakers alone, and not to make sufficient provision for local help in making up the programme. This is a grave error, for there are in all communities those who are fully capable of intelligently discussing the questions which most interest that locality, and one of the main objects and benefits of farmers' institutes is that they educate the leading members of the district up to an ability not only to interest their audiences, but also to make them fully competent to manage and carry on the meetings themselves.

DIVISION OF ECONOMIC ZOOLOGY.

The fire which destroyed the State Capitol was disastrous for this division of the Department of Agriculture, and its chief, Dr. B. H. Warren, lost a portion of his private library, note books and statistics which had been collected with considerable labor during the preceding year.

Dr. Warren reports that during the past year he received 357 specimens (embracing 39 species), of insects, which were sent by farmers and others for identification; in addition to these, his report states that 78 specimens of birds, of 45 different species, were sent in and identified by the division.

Considerable attention has been paid to the collection of data and information relative to wild animals destroyed by forest fires, and to the loss by the destruction of birds and their nests by the same agency.

The attention of Dr. Warren having been called to the increase in the amount of bounties paid by different counties in the State, he has collected, and will embrace in his annual report, a large amount of statistics relating to this economic question so little understood, and to the too often foolish payment of money in the form of bounties for animals and birds which in reality are the friends of the farmer, and which should be preserved in order to retain that balance of power which nature has established between the crops and their insect enemies, and which is so often disturbed, to the great loss of the agriculturist, by the destruction of insect-eating birds.

In the line of special investigations the force of the division has been directed to the following topics:

1. Field mice and best methods for their destruction.
2. Grasshoppers, and how to get rid of them.
3. Lice and other insects which annoy cattle.
4. The English sparrow and its relation to agricultural interests.
5. Currant, grape and gooseberry destroying insects.
6. The wheat weevil and wheat midge.

In the investigation into the habits of the English sparrow and its effects upon agricultural interests, a large number of circular letters of inquiry have been sent out and replies received from farmers and others interested. The Zoologist and his assistants have made a number of examinations of the stomachs and other organs of this sparrow, and have, in this manner, been furnished with evidence as to the character of its food and the effect which it, either directly or indirectly, exercises upon the agricultural interests of the State.

FORESTRY DIVISION.

The Forestry Division, under the energetic leadership of Dr. Rothrock, has, within but little more than two years, taken a position well towards the front of all states which have by legislative action shown an interest in matters relating to forestry, and, if the balance sheet is to be made up from laws actually upon the statute books, it is a question whether Pennsylvania does not occupy the foremost position in all questions which relate to the preservation of her forests and the reforestration of her cleared lands.

When this division was created, it had entirely new ground to operate upon, as the citizens of our State had not had the subject of forestry brought before them except in a spasmodic manner, by which but little real good was accomplished. Many had the idea that any move in the interest of the preservation of our forests or for the reforestration of denuded areas must necessarily conflict with the pecuniary interests of the owners of these areas, and that the systematic preservation of our forests meant the prohibition of the cutting of timber by their rightful owners.

Commencing thus upon really negative ground, Dr. Rothrock has changed this view not only among the owners of timber lands, but also among members of our Legislature until it is generally understood that the interests of the State as to forests need not in any manner conflict with the interests of the owners. It is a conspicuous fact that thus far, in the already large collection of laws relating, directly or indirectly, to the interests of forestry, there is not a single provision to be found which is not in the interest of the forest owners as well as the State. It is true that at first glance it may seem that some of the provisions of laws enacted by the last Legislature appear to react against the interests of the owner, but a careful examination and the results of the future, will clearly show that this is not the case.

Recognizing the fact that the greatest enemy to reforestration has been the forest fire, the Department has used its best efforts to educate the people up to a true understanding of the question, and to show them that the theory that railroads are the main causes of these losses is not correct, but that careless hunters, boys and similar preventable causes, create more loss than do locomotives and all other causes combined.

Two acts bearing directly upon this phase of the question were made laws during the session of 1897. One makes it the duty of constables to act as fire-wardens, and the other increases the responsibility of county commissioners in the same direction, and it is believed that, coupled with a healthy and correct public sentiment, that both of these measures will decrease our annual losses from forest fires.

Another step in the same direction was secured by the passage of the act which authorizes all peace officers to arrest, without warrant, such persons as may be guilty, either through carelessness or design, of causing fires in forest areas. It is true that by some, this step is regarded as dangerous and possibly not warranted by custom or precedent, yet it is believed that it will, when supplemented by other legislation, effect much good.

An act was drafted by this division providing that all unseated lands and lands sold for taxes should become the property of the State for the formation of forest reservations, which shall assist in the protection of the headwaters of our streams and water courses, the theory being that as now situated they are totally unproductive and that, under the provisions of the act, they will not only in time become productive, but will also materially assist in the restoration of the balance required by physical laws which have too long been violated.

The Forestry Division, assisted by the Department and its other sub-divisions, has also secured the enactment of a law which partially relieves forest lands from taxation and which, in a similar manner, encourages the intelligent care of cleared lands by which the growth of valuable timber is encouraged and rendered possible.

The passage of the act of May 25, 1897, probably constitutes the greatest achievement of the Department in the direction of forest protection and water supplies. It was at first met with strong opposition because its merits and intentions were misunderstood, but after it had been thoroughly explained to our people through the medium of farmers' institutes and to the Legislature through its proper committees, nearly all opposition was removed, and it is safe to state that appropriations and investments made by the State, under the provisions of this act, will prove to the citizens of the future the most profitable investment that could have possibly been made, and, as its operations are founded upon one of the most solid of all theories relating to the interests under the care of the Forestry Division, it is not too much to say that, if properly supported by subsequent legislation, our State will soon take the foremost position with her forest reservations and the protection of her water supplies; and it is, indeed, fortunate that the location of the head waters of our main streams is such that three reservations, if of sufficient size, will effect the same results that would require many smaller ones in other states.

In bringing the subjects under his care to the attention of the public and especially to that portion most deeply interested in agriculture, the Commissioner of Forestry has had a powerful aid in the extensive series of farmers' institutes which have been held in every county of the State during the past three years, and he has made use of this potential influence for good by delivering more than fifty illustrated lec-

tures in various portions of the States, and others in surrounding states where his services have been asked, and it is needless to add that these lectures have had much to do with forming public opinion into such a condition that has rendered the legislation above alluded to not only possible, but also popular.

The destruction of the special report of this division by the burning of the State Capitol was a misfortune, but the almost unanimous passage of an act of the Legislature for reprinting it, furnished but another proof of the fact that an unusual and lasting interest has been awakened in our State on this subject.

The special report of Dr. Rothrock shows that the division has over 1,500 practical correspondents, and that a large number of blanks have been sent out asking for information relative to the amount of timber which has been cut during the year, the condition and value of that left standing and for information upon other topics relating to the forest interests of our State, and the replies already received to these circulars of inquiry clearly prove that Dr. Rothrock will be able to lay before our next Legislature information of such a practical character as will relieve the division from any mistaken criticism and show the wisdom of the legislation secured last winter.

Arrangements have been made to secure special reports from experts in relation to the relations of our forests to water powers which, owing to the rapid introduction of electricity as a power, are annually becoming more valuable and more worthy of protection. The study of the various fungi which causes more or less loss to our forests, shade and fruit trees has also had the attention of the division, and it has been the pleasure of the Department to heartily co-operate with Dr. Rothrock in this special direction.

At several times during the past year, the attention of the Department has been directed to the loss of shade, fruit, forest and ornamental trees from the exhalations of mines and certain manufacturing industries; this subject has been referred to Dr. Rothrock and his assistants, and his forthcoming report will, I am sure, deal with the problem in a manner which will prove satisfactory to all concerned, and will enable the Legislature, if action is necessary, to act intelligently in relation to the subjects involved.

The following quotation from a friend of the forestry cause in our State is so appropriate that I transfer it to my report as conveying my own sentiments:

"The division is young. It deals with problems hitherto new and unsolved in our Commonwealth. It is safe to assume, however, that the magnitude and importance of its operations will become more and more apparent with each successive year, and that henceforth it must be considered as an essential factor of our State Government."

DAIRY AND FOOD DIVISION.

The work of the division under the control of the Dairy and Food Commissioner has progressed steadily, but it is greatly to be regretted that a lack of funds has more or less crippled the performance of certain duties pertaining to the office. The annual appropriation of $12,500 is too small to accomplish the work devolving upon the division, especially as each succeeding Legislature has, by the enactment of new laws, added new and expensive duties without a compensating increase in the amount appropriated for expenses.

When the Legislature devoted the fines collected to the expenses of the Commissioner, it was no doubt under the impression that it was adding largely to the income of the office, but it was not then, as it is now, understood that the fines collected in the average suit are not equal to the salary and expenses of the special agents, lawyers and chemists necessarily employed, nor was the fact taken into consideration that he fines from various acts delegated to the Commissioner for enforcement would naturally decrease as the public became acquainted with the provisions of the act, and that the adulteration of all articles of food would gradually decrease, but that this decrease, while it materially diminished the amount of fines collected, would not be followed by any material decrease in the expenses of enforcing the laws, inasmuch as the same number of special agents would be required and the same amount have to be expended in their travelling and other expenses.

During the past year this division has kept an average of seven special agents steadily at work inspecting the various articles of trade specified by the acts of the Legislature, and during a portion of the time ten agents have been at work. The proper enforcement of the laws relating to articles of food has also required considerable expenditure for legal advice and assistance in bringing suits, settling points involved in the construction of the various laws, and in the payment of chemists for the analyses of samples furnished by the special agents.

In order to economize in the direction of costs of attending suits, the Department has appointed five chemists and has thus been enabled not only to economize in expenditures, but has also been able to push the work forward with greater rapidity and certainty, and has been placed in a position in which its work can give better satisfaction to those most directly interested—the consumers and retail dealers.

The effect of the various pure food laws, and especially of the one relating to food products, has been very evident, and the progress

made in clearing up the trade and in substituting first class articles for adulterated ones, is so plain that even those who were at first opposed to the provisions of the law when it left the care of the Legislature, are now among its best friends and are loudest in their praise of its effects.

Although this act has been in force practically but a little more than two years, the effect of its enforcement, as shown by the shelves of the average grocery store, is very evident. When the Commissioner commenced the enforcement of this special act, Pennsylvania was the dumping ground for all kinds of adulterated goods. Surrounding states all had done more or less to clear up this objectionable condition of affairs, and as a natural result, our State was receiving more than her share, but an examination now of any town or city in the State will clearly show the effects of the work already accomplished, and possibly prove to the observer that more may yet be done in the same direction.

The special agents have been carefully instructed as to their duties, and informed that the enforcement of the various laws did not mean a crusade for the recovery of fines or for the punishment of those who innocently disobeyed the provisions of the law and were only technically guilty. The agents were clearly instructed by the Department that the pure object of their work was to secure the enforcement of the law, and that the plan which accomplished this result with the least loss and trouble to those directly interested, was the best and the one most desirable. As a result of this construction of the law, which was fully endorsed by the Attorney General, the Department has reserved the right to review the finding in a number of cases in which it was clearly proven that the defendants were innocent of any intent to evade or defy the law, and that articles which had been found among their stock as adulterated were purchased by them in good faith.

In a number of cases in which the retail dealer has been found guilty of a violation of the laws relating to pure food, and it was clearly proven that he was not aware of the character of the article sold, a compromise has been made upon his furnishing evidence for the prosecution of the wholesale dealer from whom he purchased the goods.

One of the most evident effects of this mode of procedure has been a healthy change in the manner of making purchases, and the adoption by the retailer of the habit of demanding written guarantees from the wholesaler as to the character of the goods purchased. The enforcement of these acts has also caused the formation of associations of dealers in the same or similar lines of trade in nearly all of our larger cities and towns. These associations, in many cases, employ a chemist, and have all doubtful goods tested, and also apply to the Department for written rulings as to branding, marking, etc., and it is a

matter for congratulation to the Department that every change thus far made by the retailer in his mode of buying has been directly in the course of protecting the interests of the consumer as well as his own.

The benefits conferred by the Department in the enforcement of the several food laws cannot be estimated with any degree of certainty, and our only method of reaching even approximate results is by comparison with other states in which similar laws have been in force for a number of years.

Dr. Abbott, of Massachusetts, estimates that in that state the enforcement of food laws have annually saved its citizens not less than $41,250,000. Dr. Neal, formerly Dairy and Food Commissioner of Ohio, estimates the saving in his state from this source at $7,280,000. The experts of the National Department of Agriculture estimate that the proper enforcement of pure food laws will save the average community not less than fifteen per cent. of the cost of their food products.

Each year's progress shows that, taking the same number of samples as a basis for the calculation, the number of adulterated samples falls off quite rapidly, until, even after the lapse of but a little more than two years, we find that they have fallen off to a degree which is plainly noticeable, not only in the work of the Department, but also in the appearance of the goods on the shelves of the stores in all of our principal cities and towns, and that this effect is rapidly being extended to the smaller villages of the country districts, and that, where plain adulterations were sold two years ago, other goods have been substituted or the lower grade goods labeled so as to conform with the requirements of law.

Many hold the opinion that adulterated articles have been largely driven from the market. This is an error, for there are numerous low grade and adulterated goods which can be legally sold, and, indeed, the intention of the pure food law was not to prevent the sale of such articles, if they contained nothing injurious to health, but to enable those who wanted and were willing to pay for pure goods to obtain them, and at the same time open the market, under proper restrictions, to lower grade goods.

Thus, substitutes for coffee, which contained no genuine coffee, whatever, are legally sold, not as coffee, as was the case previous to the enactment of the law under consideration, but as "imitations" and mixtures," so that the purchaser who wanted a pure article of coffee has been secured the privilege of purchasing it openly and surely, and at the same time the right of other citizens to purchase cheaper and lower grade articles has not been curtailed but merely regulated and restrained so as to protect other buyers.

Two years ago the shelves of many groceries were filled with numerous imitations which were sold in close competition with the genuine

article, and often sold as absolutely pure, but these are now sold only for what they really are. Glucose, with a small piece of genuine honeycomb in the jar, as an evidence of the purity of the supposed honey, may still be sold, but not as genuine honey, and the same rule may be followed all through the trade in articles covered by the pure food laws, the enforcement of which has been delegated to the Department.

During the past year the agents of the Department have been brought more or less in contact with samples of ground mustard to which quantities of starch had been added. In some cases this addition has been conclusively shown to amount to the extent of seventy per cent. In one case of this kind, the Department officers were practically non-suited, although adulteration with starch to the amount of seventy per cent. was clearly shown and practically admitted, on the plea that mustard was not a "food" within the meaning and requirements of the Pure Food act, and that, therefore, conviction could not follow. The correctness of this position is controverted by all cases tried under the much older English Food laws by which everything, except baking powder, which enters into the composition of food, is considered as "food" within the meaning of the law and adulterations and substitutions severely punished.

The Legislature of 1897 very materially added to the duties of the Dairy and Food Commissioner by the enactment of a law regulating the branding, grading and sale of cheese, and by the provisions of the vinegar law, which includes all kinds of vinegars sold, or offered for sale, in the State. The previous act relating to vinegar was confined exclusively to cider vinegar and to fruit vinegars.

To carry out these two acts in a thoroughly effective manner would require the united service of all of the special agents now employed by the Department, and would thus leave no funds or agents for the enforcement of other and quite as important laws. This fact plainly shows that the appropriation made for this division is out of all proportion to the work demanded of it, and that it should be increased at the first opportunity. It is utterly out of the question to expect the Dairy and Food Commissioner to enforce all of the laws relating to pure food, vinegar, cheese, lard, oleomagarine and other adulterated food products with but seven special agents to patrol the whole State, when other States make use of a larger force for the enforcement of a single law.

The work of the Department in the direction of regulating the food supplies of the State has met with the hearty co-operation of all classes interested. Those who, at first, were disposed to throw obstacles in the way of enforcing these laws have become our hearty supporters, and in our work we repeatedly receive assistance and information from those in the trade, which enables us to more economically

enforce the laws and at the same time secure a more general application of the various decisions made and distributed among dealers, some of whom have, through their associations, even gone so far as to print, at their own expense, the decision of the Attorney General and of the Department relating to important points in the construction of the laws under consideration. There is scarcely any phase of the question which more clearly demonstrates the value of these acts than the fact that the Department has been able to secure such general cooperation in its work.

The attention which has already been given to the cheese and vinegar acts of the session of 1897 clearly demonstrates the fact that important modifications are needed in both, and that these should be carefully considered and secured as soon as possible. Among the most important of these I may suggest the amendment of the cheese law so as to reduce the legal grades of cheese from five to two, or at most to but three, and the amendment of the vinegar law so that its provisions may be made more clear and readily understood by the dealers as well as by the special agents of the Department. Several of its provisions are contradictory and are capable of more than one construction, while the whole act is too cumbersome and lengthy for the best practical results.

VETERINARY DIVISION.

Under the care and supervision of Dr. Pearson, this division of the Department has made rapid advances during the past year, and, if legislative action is to be taken as the criterion of endorsement, it has been remarkably successful; its work is so intimately connected with that of the State Live Stock Sanitary Board that it is absolutely necessary to consider the two as one, and this is made all the more easy because, with the exception of the Governor, all of the members of the Board are officers of the Department, and all of the expenditures of the Board must be endorsed by the Secretary of Agriculture.

During the past year the work of this division has been mainly directed against tuberculosis and glanders; and in the former work about 16,000 animals have been examined with tuberculin and about 2,500 condemned as tuberculous and paid for, in accordance with the provisions of law. The fact that fifteen per cent. of those examined are found to be tuberculous must not, however, be taken as an indication of the possible amount of infection existing, for the herds re-

ported are only examined with tuberculin after their owner has satisfied the officers of the Board that he has good reason to suppose that the herd is infected; and it therefore follows that this proportion can only be accepted as referring to the suspected herds of the State.

The price paid for infected animals condemned and killed by orders of the Board has varied greatly, the maximum for animals of common stock being fixed by law at $25.00 each, and for registered ones at $50.00 each; the actual valuations have varied from these amounts down to less than ten dollars in some cases. The report of Dr. Pearson, in another portion of this volume, gives the more exact figures as to probable infection, condemnation and valuation.

During the session of the recent Legislature an act was passed giving the Board power over the motions of animals coming into our State, the theory being that it would be impossible to even partially free the State from tuberculosis so long as infected animals were liable to come in from other states, and so long as the fact that such animals were paid for by our State officers, might possibly constitute an incentive to bring them over our borders. This act gives the Board great powers which should be used with proper caution and discretion, and in such a manner as to inflict a minimum of loss and trouble upon the interests affected. The Board has adopted rules for governing the movements of animals coming into the State which it is believed will, while they give the least possible trouble to owners that is consistent with safety, at the same time give the maximum of protection to animals already in the State.

The act upon which these rules are founded gives the shipper the choice of three plans, either of which is carefully provided for by the rules of the Board, and either of which will be satisfactory to the Board as a means of protecting the interest of resident stock owners.

These provisions, which follow the lines laid down by the law, are practically as follows:

1. The officers of the Board will accept as sufficient evidence of freedom from contagious disease the certificates of proper officers in the states from which the animals are shipped, and the State will expect the same courtesy from the officers of other states to which animals may be shipped from our own State.

2. The animals may be detained at or near the point at which they enter our State and there tested with tuberculin by some one approved by the Board, and, proving free from disease, will be entitled to a permit which will allow their shipment to any portion of the State.

3. They may be shipped in quarantine to their ultimate destination in the State and there be submitted to a tuberculin test by a surgeon, approved of by the Board, and his certificate of freedom from disease shall be deemed conclusive evidence that the animals can be safely mixed with stock already in the State.

Section second of the act (act of May 26, 1897) provides, that except in the first plan, the tuberculin tests shall be at the expense of the owner, and may be performed by any surgeon selected by the owner who is also satisfactory to the Board, but that the latter requirement is imperative in order to prevent tests by incompetent persons.

It is as yet too soon to judge of the effects of this law, but the experience of other states which have adopted its leading provisions make it evident that its effects must and will be beneficial, and will prevent the introduction of diseased animals into our State. Its effects are not applicable to animals intended for slaughter, and by the express provisions of the act itself are limited to "dairy cows and cattle for breeding purposes," and it therefore inflicts no hardship or inconvenience upon the trade in beef cattle.

Those who have given attention to the question of tuberculosis, as it exists in the human and animal races, have been strongly impressed with the theory that many of the cases are preventable, and with proper precaution and care, need not necessarily lead to the death or condemnation of the animal infected. But there was nothing practical to which the members of the Board could point as a proof of this belief and theory. It was believed by the members of the Board that a portion of the State funds carefully and economically invested in ascertaining the correctness or falsity of this theory would be a good investment, and accordingly the Legislature was asked for a specific appropriation to be applied to this purpose only; one of $15,000 for two years was promptly granted, and the Board has commenced a series of extensive experiments to show the comparative effects of the best and worst sanitary surroundings and their results in spreading the disease, and, although too early to give anything in the form of a conclusion, yet I may state that everything points to the belief that, when surrounded by the best sanitary conditions, the spread of tuberculosis through a herd, and possibly through an animal, may be prevented and that while, as in the past, animals of a certain conformation will prove more liable to the disease, yet we think it will be conclusively shown that much of its losses are preventable and that the sanitary surroundings have much to do with the percentage of loss.

By the use of its current funds under former appropriations the Board has conducted experiments with tuberculin and tuberculous animals which have proven to the entire satisfaction of Drs. Pearson and Ravenel that repeated injections, until the system fails to show reaction, will and does encyst the tubercles, and will in this manner check the disease to a very material degree. Cows infected with tuberculosis in one of its worst forms and from one of the worst infected herds in the State, were placed under favorable sanitary surroundings as to light, air and food and injected with tuberculin until their systems failed to react; one of these animals was killed and a

post mortem distinctly showed that the tuberculous deposits had been encased in a gristly material which, at least for the time being, prevented any danger from them, and that they appeared to exist in the animal merely as so many foreign bodies, and as harmless as a bullet or shot encysted in the same manner.

It has also been shown by the officers of the Board that an infected animal, after three or more carefully conducted injections, fails to react to the tuberculin test and the inference is that, except by reinfection, such animals are free from the danger of communicating the disease to others or from injury to themselves, but further and more extended experiments are needed, and will be made, before definite conclusions can be safely arrived at, but sufficient has already been shown to prove that if the work of the Board had been confined to these experminents alone, the results would have fully warranted every cent of expenditure which the State has thus far been called upon to make.

Acting upon the information given above, the Board has ordered the erection of a building which shall combine within its limits the best and worst sanitary surroundings, and animals have been placed in its various parts under conditions which will give sanitary surroundings, especially as to air and light, their full power and effect, and the results will be looked for with no little interest on the part of the members of the Board and others who have interested themselves in the experiment. If the results are as it is anticipated they will be, it will not only greatly economize the enforcement of existing laws, but will also serve as an object lesson to the dairymen of our State, many of whom are encouraging outbreaks of tuberculosis and other contagious diseases by violations of the laws of sanitation, and, if the experiments are successful, the Board may, instead of giving, as now, mere assertions as to the effects of sanitary surroundings, can point to demonstrated facts as a proof of their statements.

The Board also has, at the Veterinary Department of the Pennsylvania University, a laboratory under the care of Dr. Ravenel, in which tuberculin for tuberculosis and malein for glanders have been prepared and a large amount of expenditure saved to the State, and in addition, the Board and its officers have been furnished with an article upon which they could rely for results; an important consideration, because a slight defect in the agents used might not only render them abortive but even dangerous by giving a sense of safety which did not legitimately exist.

It is gratifying to report that the opposition which at first met the work of this Board has all vanished, and that instead of opposition there are now more applications for tuberculin tests than the funds at the disposal of the Board will admit, and that instead of making tests in all cases of applications, the Board is compelled, as an act of justice to the owners of infected herds, to demand some proof that the appli-

cant has good reason to suspect that his herd is infected, and when, as has been stated, even under these provisions, there are more applications for tuberculin examinations than the Board can attend to, it speaks volumes for the popularity of the work performed.

It is also a matter of congratulation that, notwithstanding the large number of animals examined and condemned, no mistake has yet been made, it being a rule of the Board that post mortems shall be held of condemned animals, so that there may be no room for doubt as to the correctness of the tuberculin tests, and the surgeons employed have in all cases positive orders to do everything in their power to demonstrate the correctness of the tuberculin tests as a means of diagnosing tuberculosis.

In addition to the work in connection with tuberculosis, Dr. Pearson has also devoted more or less time to hog cholera and to rabies and other contagious diseases, and in all cases in which any disease of this character has been reported, advice has been freely given, or, if the cases appeared to warrant it, an examination was made of the outbreak, and it is believed that much good has been done in this manner.

TOBACCO EXPERIMENTS.

Previous to the year 1895, the Pennsylvania State College Experiment Station had commenced a series of experiments for the purpose of ascertaining the results of different fertilizers upon the yield and quality of the tobacco crop, and had, up to the year named, carried them forward to a point at which their value and usefulness to the tobacco growers of our State was evident. An act making an appropriation to carry on the work during the term from June 1, 1895 to May 30, 1896, having failed to become a law, the Department of Agriculture, fully recognizing the value of the experiments as far as completed and believing that their result in the future would fully warrant the outlay, pledged itself to the officers of the Station for bills incurred in the carrying out of the experiment, provided the total amount of the bills did not exceed $1,000 per year for the two years named.

When, after the legislative session of 1897, the Legislature again failed to make provision for these experiments, the Department again pledged itself for the expenses for the two years ending May 30, 1899.

This action compelled the Department to economize in other directions, but it was then believed, and the results have confirmed that be

lief, that the value of the experiments to the tobacco growers of the State would be far above the cost to the Department, and none of the officers of the Department have thus far regretted the economy which they were thus compelled to exercise in certain directions, in order not only to continue the good work commenced by the Station, but also to save the work and expenditures which had been incurred when the Department assumed the expenses of the experiment, and our only regret has been that the amount appropriated to the general work of the Department was so limited, that the above amounts could not be safely exceeded without material loss in our work in other directions.

This series of experiments was originally commenced for the purpose of ascertaining the effect of different kinds of fertilizers upon not only the yield, but also the quality of the tobacco leaf, and they included outlays which no private grower could be expected to assume. Their primary object is thus outlined by Dr. Frear, Chemist of the Station and Department of Agriculture, who has charge of the work:

"The problems considered were prominently these:

1. What is the effect of phosphoric acid, in the soluble form, upon tobacco development?

2. Is carbonate of potash, in the form of a double carbonate of magnesia and potash, superior to sulphate of potash?

3. Which is the preferable form of nitrogen, fertilizers containing its nitrogen in an inorganic combination or one in which a portion of it is supplied in the more soluble and more quickly available forms, or nitrates or ammonium salts?

4. Among the sources of organic nitrogen, which is the better, those more quickly disposable in the soil, such as cotton seed meal and linseed meal, or a material probably more slowly decomposed, such as bone-dust? And then, in general, how does each of these combinations of commercial fertilizer materials compare with the ordinary application of horse manure?"

Tests of this nature with tobacco have elements of doubt involved which are not found in ordinary farm crops, and hence different problems are to be dealt with; it is one matter to produce a large weight of leaf and another to produce leaves of a first class quality, and it is well known to all tobacco growers and dealers that it is possible that a smaller crop of excellent quality may produce more profit per acre than a larger one of second class in quality, and hence, in outlining these experiments Dr. Frear included the following items:

1. The weight of the crop.
2. The proportion of the better sorts of leaves.
3. The proportion of leaf to stalk.
4. The proportion of the stripped leaf to the mid-rib and stem.
5. The thickness of the several portions of the leaf as shown by accurate measurements.

6. The size of the leaf shown in the same manner.

7. The burning quality of the leaf.

8. The quality of the cured leaf judged by the expert tobacco buyer.

9. The quality of the sweated leaf judged in the same way and from partial analyses.

10. The quality of the tobacco in the cigar adjudged by various experienced smokers.

In order to render the experiments of as general value as possible, these experiments were carried on in duplicate in some of the most prominent tobacco growing regions of the State, a careful analyses of soils and fertilizers made, and a series of very careful weather records kept; in fact, the experiments appear to have been guarded at every point and made as practical as possible under the circumstances, under which they were and are conducted.

A third factor in these experiments is thus outlined by Dr. Frear in his report to the Department:

"A third line of experiment has been undertaken to determine, more precisely than had heretofore been done, the exact conditions of temperature and humidity prevailing in Lancaster county curing barns so constructed that these conditions of temperature and humidity could be controlled, to ascertain whether it might not be readily possible to avoid the dangers that threaten the crop curing in the ordinary manner, and even to improve and make more uniform the character of the cured leaf. Experiments have been carried on for two seasons in the Snow barn, which is constructed so as to permit the control above indicated, and in addition to the work on curing, some preliminary experiments have been made upon the forced sweating of the tobacco leaf, also under controlling conditions of temperature and humidity."

The importance of these experiments is such that the Legislature should not trust to their being carried on by the Department of Agriculture from its limited appropriations, but the Station should have liberal legislative support, as State funds expended in this manner will be sure to give direct benefit to all who are engaged in this important branch of agricultural industry, and all encouragement is at this time particularly applicable, as it is believed and hoped that we are about entering upon an era of increased prosperity for this special industry.

SPECIAL INVESTIGATIONS.

Section sixth of the act of March 13, 1895, provides "That the Secretary may at his discretion, employ experts for special examinations or investigations."

Acting under the authority given by this section, I have employed suitable persons to make the following investigations and reports, the results of which have appeared or will appear either in this report or in the form of bulletins:

1. The Milk Supply of Cities; by M. E. McDonnell, of the State Experiment Station. The object of this investigation is to obtain a practical knowledge of the milk supply of our leading cities and towns, so that the Department may be in proper shape to give definite information to the committees of the Legislature under whose consideration and action proposed laws regulating the milk supplies will come; during the past sessions of the Legislature the committees of both branches of the Legislature have been confused by a mass of conflicting evidence, often of exactly a contrary nature, coming from men who are apparently entitled to consideration, and thus far the result has been that we have either secured no legislation at all or have added to our statute books that which has proven to be a disadvantage, rather than a benefit. It is believed that the report of Mr. McDonnell will present the matter in a practical and unbiased form, which will give those requiring it, information of value.

2. Effects of Lime Upon Crops an Soil; by Dr. William Frear, Chemist of the Department and of the State Experiment Station. The discussions at our farmers' institutes and other agricultural meetings has fully proven that there is not only a wide difference of opinion among practical men as to the effects of lime, but also as to the manner in which it produces these effects. Dr. Frear was requested to give the matter a careful examination, make a long series of chemical analyses and gather from practical farmers all the evidence possible. The work is one which will require much time and careful examination, and no report is expected this year, and the examination will be extended into next year, and a final and conclusive report will be made as soon as practicable.

3. Motive Power; by J. A. Hunter, Pennsylvania State College. The fact that our farmers are using naptha engines, horse power, steam engines, wind and other powers under the same conditions and often under similar surroundings, has convinced many that the question of economical motive power is one which needs attention, and Mr. Hunter has been selected to give the question, in all of its bearings, a careful

examination and report, and it is believed that when he has concluded his work, we will have a mass of evidence which will throw much light on the subject.

4. Ginseng Culture: by Prof. George C. Butz, Pennsylvania State College. As our farmers as looking around for what may be termed "side crops" to add to the profits of the general agriculture, it seemed as if the fact that large amounts of ginseng are annually bought and shipped to China and other Asiatic ports, and that it grows wild in some of the counties of our State, and may be cultivated in all of them, it was believed that an investigation as to yield, profit and culture might be of benefit, and hence the selection of the subject and the appointment of Prof. Butz to investigate and report on it.

5. Butter Supply; by Harry Hayward, State Experiment Station. In these days when oleo, "boiled butter, manipulated butter, cream ripeners" and other sources of a contaminated butter supply are so prevalent, it was thought that a careful investigation into the general subject of "butter supply" might result in good to our dairymen and consumers, and attention is called to the report of Mr. Hayward as the means of settling many of the disputed points in the topic which he has so ably investigated.

6. Sex in Plants: by Josiah Hoopes, West Chester, Pa. The long connection of Mr. Hoopes with the growth of trees, plants and shrubs seemed to make him especially suitable for investigating and reporting upon this subject which, to the average farmer, has so many mysteries, nearly all of which disappear under the light of Mr. Hoopes' investigations.

7. Bark of Trees; by Thomas Meehan, Germantown, Pa. This question is always one of interest, and leads the practical farmer to an investigation of the wonders of nature which are all around him, and, with similar knowledge he cannot but make his calling more pleasant and less monotonous.

8. Fungous Diseases of Trees; by Prof. Byron D. Halsted, New Brunswick, New Jersey. The annual loss to trees by fungoid diseases and the want of a proper knowledge of these diseases and their character are sufficient excuse for the adoption of it for an investigation, such as is reported by Mr. Halsted elsewhere.

9. Tobacco Culture; by F. R. Diffenderffer, Lancaster, Pa. The importance of this crop to the farmer in general and to the Lancaster county farmer in particular, and Mr. Diffenderffer's well known connection and close touch with the best and most practical growers of the State, are a sufficient guarantee that the subject assigned to him has received its proper share of care and attention.

10. The Action of Preservatives; by Dr. Henry Leffman, Philadelphia. This topic, in the interest of legislation in relation to the use of preservatives in milk and their effect as noted by the officers of the

Dairy and Food Division, as they find them in food products, makes the question one of great importance. Nothing has been done in the line of scientific research in this direction recently, and it is believed that the report of Dr. Leffman will settle many of the perplexing questions which have from time to time met the officers of the Department in carrying into effect the various food laws now upon our statute books.

11. Farm Titles and What They Include; by Hon. John P. Elkin, Indiana, Pa. Mr. Elkin's fitness for an investigation of this character is undoubted, and anything that he may furnish will be accepted as correct.

12. Legal Rights and Duties of Farm Employer and Farm Employe; by Hon. Geo. W. Hood, Indiana, Pa. The addresses on this and similar topics which Mr. Hood has from time to time delivered at meetings of the Board of Agriculture are a sufficient guarantee of his ability to handle his topic.

13. Cheese Examinations; by Drs. Frear, Aschman and Cochran. During the period which elapsed between the passage of the law regulating the manufacture and sale of cheese and its being put into force, various questions were raised against the law by dealers in cheese; these all depended upon practical and readily ascertainable facts, and a series of analyses were ordered in three series, each by a chemist working independently, and the results as obtained have not only proven of great use in our own State, but have also attracted more or less notice in all states in which similar laws are in effect. The result of the investigations was to satisfy the dealers in cheese that in the main, theory contentions were founded upon a basis which were not practical, and which would not bear the light of impartial investigations.

14. Poisons Developed in Food by Fermentation; by Prof. F. T. Aschman, of the Department for the Western District of the State. This investigation will include the formation of poisonous matters in cheese, milk and other dairy products.

15. Coloring Matters in Food and Confections; by Prof. C. B. Cochran, West Chester, Pa. During the enforcement of the various acts relating to food and food products a prominent side question which often came up was that of the use and effects of coloring matters, and Prof. Cochran was directed to make a careful examination and report results; this work has required a large number of analyses and is expected to furnish the officers of the Department with reliable and practical information which may in the future guide their actions in the enforcement of laws which directly or indirectly relate to the use of injurious coloring matters.

16. Gardening for Market; by R. M. Simmers, Phoenixville, Pa. The addresses of Mr. Simmers at our farmers' institutes have aroused a desire upon the part of our farmers who reside near large towns

and good markets for vegetables to know more as to their production, profits and yields, and to gratify and supply this clearly expressed want, Mr. Simmers was selected for the duty of examining and reporting upon the question. The fact that he has for many years been a practical market gardener eminently fitted him for the work and his report will fill a want, felt and expressed, in the agriculture of our State.

17. Farm Prices; by Gilbert Cope, West Chester, Pa. During discussions of topics relating to the farming of the past and present, no subject came up with greater frequency than that of the comparative prices of the past and present, and Mr. Cope was accordingly appointed to collect data and make a report which should place upon record these items in such a manner as to hereafter settle the question beyond a doubt.

18. Butter-fat, Water and Curd in Butter; by Prof. F. A. Genth, Philadelphia, Pa. During the enforcement of the law relating to oleomargarine and imitation butter the officers of the Department were often met with questions, perhaps on the witness stand, which involved the relative proportions of butter-fat and water in butter; in the analyses made by our chemists the one item of water was found to vary greatly, and hence it was deemed important that we should have definite information which would enable us to judge when the elements of water and curd existed in sufficient amounts to constitute adulteration within the meaning of our law. The examination has involved a large number of analyses of samples of butter, and we consider the results as conclusive and entirely satisfactory. They are in a form in which they can be used during suits for the enforcement of any of the laws relating to dairy products.

19. Practical Experience with Forest Restoration and in Creating a Forest Nursery; by F. R. Meier, Consulting Forester. The recent enactment of laws relating to forestry, forestry reservations and reforestration of cleared lands makes it important that those interested should have the best and most recent data upon which to work. The position of Mr. Meier ensures a practical and complete treatment of his topic which cannot fail to be of interest and value to the reader in search of information along the lines of the subject upon which he reports.

20. The Economic Relation of the Mole to Agriculture by Harry Wilson, Gum Tree, Pa. This investigation is upon new ground and contains much that will be new even to farmers who have observed some of the habits of the animal named.

21. Fungi Affecting our Forest Trees; by Prof. Byron D. Halsted. New Brunswick, New Jersey. The intimate knowledge which Prof. Halsted possesses in relation to all fungous growth is a sufficient guarantee for the character of his report upon this topic.

22. Relation of Forests to Water Power; by John Birkinbine, Philadelphia, Pa. If any apology was necessary for an investigation into this topic, it would be found in the condition of the failing water powers of our State, and its economy in the growing value of and demand for water powers for the generation of electricity. Mr. Birkinbine is an acknowledged authority upon this and similar questions.

23. The Pulp Industry as it Affects our Forests; by Dr. J. T. Rothrock, Forestry Commissioner of the State. It is an important topic and one which carries with it an interest which is intimately connected with reforestration and the preservation of our present forest areas.

24. Forest Fires and the Best Methods of Subduing Them; by George Boak. This embraces a question in which all farmers are indirectly interested and in which all owners of timber lands are directly interested, and the investigation treats of a branch of the forestry problem which is of great importance just now in consideration of the advanced station taken by our State Legislature in relation to forest fires and their prevention.

25. The Actual Losses Sustained by the State During the Past Year From Forest Fires; by Robert S. Conklin, Clerk of the Forestry Division of the Department of Agriculture. Mr. Conklin has given much time and attention to the topic, and collected a large amount of raliable data bearing directly upon the question of losses from this source, and some of his deductions, facts and figures will more or less surprise those who may have given the question but superficial attention.

26. The Danish Method of Controlling Tuberculosis in Cattle; by Prof. B. Bang, of the Veterinary Agricultural College of Denmark. The connection of Prof. Bang with the work of eradicating tuberculosis in Denmark gives him an immense fund of information upon branches of the work which are either comparatively unknown or but little understood in this country. The fact that the work of eradicating or controlling tuberculosis in Denmark has been in progress, much longer than any similar work in this country, gives Prof. Bangs' article a special interest and value.

27. Detection of Adulteration in Butter; by Prof. C. B. Cochran, West Chester, Pa. As chemist of the Dairy and Food Commissioner and of the Department, Prof. Cochran has analyzed and reported upon a large number of samples of butter, and this report is the result of his experience in the work.

RURAL FREE MAIL DELIVERY.

In my annual report of last year I used the following language, and the results and experience of another year would only lead me to make it even more emphatic:

"The discussions of our farmers' institutes and the correspondence of the Department both clearly prove that our farmers have asked for this appropriation for the purpose of testing the practicability of the plan, not because they doubted the fairness or justice of the request, but because they realized clearly that the question was one of comparative cost rather than expediency or justice.

"The argument has been advanced that it is out of the question to institute a general free delivery in the country districts, and this is granted. Our farmers have not asked for this nor do they believe that such a system is practicable, but if, after first being tried in the more thickly populated agricultural districts, its success or failure has been demonstrated, than it can be extended to doubtful districts, until it has been ascertained just how far and to what extent it may be carried without involving too much expense."

During the year ending June 30, 1897, this system has been practically tested in twenty-nine states and over forty-four delivery routes, and the First Assistant Postmaster General makes the following official report as to the results:

"The general results obtained have been so satisfactory as to suggest the feasibility of making rural delivery a permanent feature of postal administration in the United States, not immediately, nor in all directions at once, but in some gradual and graduated form, the character of which might be regulated by the tenor of the reports herewith presented as to the experimental service."

The first appropriation made for the test of this system was $10,000. During the year ending June 30, 1897, Congress appropriated $30,000, and for the coming year has given $50,000 for the purpose. The first service was commenced in West Virginia, October 1, 1896, and during the same year the experiment was extended to the states of Maryland, Missouri, New York, Ohio, Indiana, Virginia, Arkansas, North Carolina, Kansas and later in the year to fifteen other states, and during the past year the states of Minnesota, Kentucky, California and Tennessee. The system was first tested in Pennsylvania in November, 1896.

In Pennsylvania the system has been tested by two delivery routes, one in Lancaster county and the other in Westmoreland county. Of these tests the First Assistant Postmaster General reports as follows:

"Widely different conditions prevail in the two counties. The routes in Lancaster county run through a rich farming country, with an intelligent population, largely of German descent, and with good roads. In Westmoreland county, the conditions are hard. The rural population is scattered, the country very rough and the roads bad.

"The two routes started in Lancaster county begin at Lancaster city and include the territory embraced with the service of six minor post towns. Lancaster county is rich in post offices, there being nearly 150 fourth-class post offices within its limits, a large proportion of which, together with several star routes, might be dispensed with if free delivery in a permanent form were extended over the whole county. The area covered by the present routes is about 30 square miles, with from 16 to 20 miles of daily travel for each carrier. One route extends from Lancaster to Kready, Mountville, Windom and back to Lancaster; the other to Bausman, Millersville, Letort and back to Lancaster. The service was popular from the start and soon resulted in a large increase in the number of letters and newspapers carried.

"Two starting points were established in Westmoreland county, one at Ruffsdale, the other at New Stanton. The Ruffsdale carrier includes within his delivery the offices of Mendon, Walt's Mill and Hunkers. The New Stanton carrier's route takes in the offices of Cribbs, Target, Darrah and Madison. Within a short time after the establishment of the service the number of pieces of mail carried was doubled."

There are two points of importance established by this extract from the official report, neither of which were anticipated when the trial was first inaugurated. One is that the rural free mail delivery will displace a number of postmasters and postoffices, and the salaries thus saved should be credited to the expenses of the system. The second is that in both of the Pennsylvania counties the amount of mail matter received by farmers has either been largely increased or doubled in amount. Either of these effects should be credited to the system when its final balance sheet is made up, and both should have a fair amount of credit.

From the tabulated portion of the report above quoted from, I find the cost of the work to have been as follows, each postoffice limit being considered separately and as a distinct district: In the Lancaster county routes the average cost per piece of mail delivered, was eight-tenths of a cent; in the New Stanton (Westmoreland county) route, the cost averaged 2.04 cents; in the Ruffsdale (Westmoreland county) route, the cost per piece of mail matter delivered was 1.13 cents, and, considering the experiment in Pennsylvania as a whole, the average cost of delivering each piece of mail matter was 1.32 cents. This is without giving any credit to the probable displacement of fourth-class

postmasters and postoffices by the general substitution of the delivery system, nor does it credit the advantage which will naturally follow the rapid increase in the amount of mail matter delivered each year.

Considering the system of free rural delivery as a whole and including all the routes established by the 84 carriers in 44 states, the average cost for delivery per piece of mail has been 1.68 cents. The population thus served has numbered 22,772 and the number of pieces delivered 836,308 from October, 1896, to June 30, 1897. The average pay of the carriers has been $283.61 per year; the average area served by each carrier has been 20.93 miles; the average number of miles traveled by each carrier has been 22.

Of the manner in which this work has been accomplished, the Assistant Postmaster General writes as follows:

"According to the varying conditions of the country traversed the rural carriers perform their services on horseback, or riding in buckboards, buggies, two wheeled carts or on bicycles. In some states they have to cross farms and pull down bars and ride over some fields to deliver and collect their mails. In no instance has any serious complaint been made of this invasion of private rights. On the contrary the co-operation of the communities served has in every instance been cheerfully and effectively given. The farmers, at their own cost, have put up boxes at cross roads and at all other convenient places for the reception of the mails."

The official report suggests that farmers may, of their own volition, materially assist the system by combining the collection of mail matter by the same carrier who delivers it, and gives the following as an instance of what has already been done in this direction: "This plan has actually been put into operation by the citizens of one district of Massachusetts, on their own responsibility, they paying the mail messenger $2.00 per annum for each family thus accommodated by him."

The Assistant Postmaster General thus alludes to two of the hindrances which have been noted in the experimental delivery system:

"There has been, and naturally so in some localities, a hesitation on the part of the community to break in upon their long-established custom of riding to town for their mails when they have no assurance as to how long free delivery is to last. Then again, postmasters of the fourth class, who are paid according to the amount of mail matter cancelled in their offices, do not find it to their interest to encourage their patrons to transfer their mail delivery to the neighboring free delivery route. It is asking too much of human nature to expect them to divert from themselves a part of their income purely for the betterment of the service. That so much has been accomplished in spite of these retarding influences indicates much greater possibilities for the future."

The report from which I have quoted contains numerous items of history which are interesting to the student after information relative to the increase of our postal system; referring to the olden time manner of performing the work, he writes:

"Less than four years ago the aged postmaster of an Ohio town, then still holding the office, at the end of sixty-four years of continuous service, was able to recall the time when the charge for one letter to be transmitted 400 miles or more was 25 cents, and in commutation of this service he had at different times received, as a just equivalent for the postage, either two bushels of oats, five dozen eggs, four pounds of butter, three bushels of wheat or one and one-fourth pounds of common wool."

A general summary of the report of the Assistant Postmaster General leads one to the conclusion that the results of free mail delivery thus far have been such as clearly indicate that, with a proper appropriation from Congress, it will become a permanent arrangement for all thickly populated rural districts, and that it is capable of a greater extension than is at present thought to be either possible or practicable.

THE INTER-STATE COMMERCE ACT.

All of the acts which have been assigned to the Department for enforcement partake more of the nature of police regulations than of ordinary trade laws. The Pure Food Law of 1895 is clearly of this character; the vinegar law of 1897 and the cheese law of the same year, are also of the same character, and an examination of the principles which underlie them will convince any one that their enforcement is but the legal exercise of the police powers of the State.

This difference in the character of the two classes of laws is not properly understood, and is thus explained by Judge Williams, in his opinion in the case of the Commonwealth vs. George Schollenberger:

"His business is intra-state and not inter-state. Our act of 1885, under which this case arises, is not a trade regulation. It is a police law. This court has so repeatedly held, and our view of it was expressedly confirmed by the Supreme Court of the United States in Powell vs. the Commonwealth of Pennsylvania (127 U. S., 678), a case which turned upon that single question. It does not undertake to deal with the importer from any other country or state, but with the manufacturers and dealers within the State. It prohibits the manufacture and sale of oleomargarine within the limits of the State. It

also prohibits the sale, the offer to sell and having in possession with intent to sell the same as an article of food. It lays its prohibition on those who are fairly subject to its jurisdiction and no others. We have then, a valid police law, so declared by the highest tribunal of the land, which prohibits the sale of oleomargarine as an article of food within the State."

In the enforcement of all laws above alluded to, the Department has met the question of the effect of inter-state commerce laws upon sales of the prohibited article or with sales contrary to the provisions of the act, and in all cases our legal advisers have taken the position that the inter-state commerce acts protect articles of commerce in transit from one state to another until they are offered for sale in the state in which their sale is in violation of law, and that this protection then ceases, and they become a portion of the general commodities of the state and subject to all of the restrictions which would have, under similar circumstances, governed the offer and sale of similar articles manufactured in the State.

Taking this view of the case, the Department held that the inter-state commerce law would protect cheese shipped into our State from New York and Ohio until it was offered for sale in our State, and that the protection there ceased, and our agents have been instructed to apply the provisions of the act of 1897 just as they would have done had the cheese been manufactured in Pennsylvania.

The claim has been made that a box of cheese was an "original" package, and that, as such, it can be sold and re-sold until the package is opened and the cheese divided, but this view of the case has not been accepted by our legal advisers, and in all cases the provisions of the law have been enforced fully and in precisely the same manner as if the cheese or other commodity had been made in our State.

In referring to the effect of the inter-state commerce law as it relates to the police regulations of the State, Judge Williams (Commonwealth vs. George Schollenberger) thus decides:

"If the residence of the dealer could affect the character of his trade, then our police laws, intended to protect our own people, would operate as a discrimination against our own citizens and in favor of the citizens of other states, and would commit to those having no interests in common with us, a most odious monopoly in every kind or form of traffic which our State should attempt to regulate or suppress.

Intrenched behind the inter-state commerce clause so construed, citizens of other states could prey upon our people, trample upon our laws and make gain out of a traffic forbidden to our citizens, only to be delivered up absolutely and unconditionally to them. It would require only that the citizens of another state should establish a store in some of our towns or cities, or in all of them, and conduct a local business to meet the local demand, and when called upon by the officers

of the law, make reply that he made the goods in some other state, and, as a manufacturer, supplied himself as a local dealer with wares of a foreign state.

In the case of Commonwealth vs. George Schollenberger, it was charged and admitted that the defendant sold a ten pound package of oleomargarine to a boarding house keeper and that the package had not been opened or broken; the defense claimed that it was, therefore, an original package and not subject to State laws. In his opinion on the case, Judge Williams used the following language:

"If a pint bottle of whiskey is an original package under the protection of Congress, and can be sold as such regardless of the police legislation of the State, we cannot punish the sale to a minor, to a person of known intemperate habits, to a lunatic, on election days or on the Sabbath. All power over the traffic for police purposes is gone, and why? Because the power to regulate inter-state commerce, intended to guard against stoppage along state lines, has been extended by construction until it is made to reach and protect retail traffic carried on within any state, if the things sold have come into the retailer's store from a non-resident manufacturer or shipper.' If this be sound construction, then the power of a state to restrict or prohibit an injurious traffic does not depend upon the deleterious character of the thing sold, or the manner in which sales are made, or the public or private injury inflicted by the sale, but on the manner in which the thing sold came into the possesion of the seller."

In view of these and other constructions which have been placed upon similar laws, the Department has held that, while it could not compel a manufacturer of cheese in New York or Ohio to comply with our State law in relation to branding, yet it could with justice compel the dealer in Pennsylvania to see to it that the cheese is properly branded before it is offered for sale or sold, and in doing this it will always be found that the Department has, where the selection was possible, taken that course which would inflict the minimum of hardship upon the manufacturer and dealer alike, and that in every case the most liberal construction of the law possible has been taken advantage of in order to cause the least inconvenience to those interested and at the same time carry out the primary object of the act in protecting the purchaser and consumer.

In the recent case of the Armour Packing Company against the Dairy Commissioner of the State of Minnesota, in which the main contention was that the state law requiring that oleomargarine should be colored pink was unconstitutional, Judge Lochren of the United States Court for the Minnesota district, charged as follows:

"The state has undoubtedly the power of inspection and of confiscation in respect to articles of food put upon the market which are deleterious and unwholesome. And I think it may go further in re-

spect to articles of food and take effective measures to prevent the people from being deceived and imposed upon; not only by requiring the packages containing an imitation article of food to be so marked as to disclose its character, but may also require that the article itself, shall, in a designated way, be also marked for the same purpose."

In this case the Armour Packing Company, had in violation of law, sold oleomargarine either not colored at all or colored yellow in imitation of butter, and, during the hearing the question of inter-state commerce regulations having come up, Judge Lochren used the following explicit and unmistakable language:

"It is not invalid as interfering with the exclusive power of Congress to regulate commerce among the several states. The act does not interfere with oleomargarine as long as it remains an article of commerce and is being handled or stored as such. It is only after it has ceased to be an article of commerce and become a part of the property of the state, and as such is being sold or kept and exposed for sale that it comes under the act, which makes no distinction in favor of the article manufactured in this state or against that which is brought from other states.

"The serious question in respect to this act is whether it is a valid exercise of the police power of the state to require that all imitations of butter intended to be substitutes for that article shall be colored bright pink. It is certain, and not denied, that butterine or oleomargarine is a substitute for butter and so intended. It is equally certain that it is made in imitation of butter, even in color, so that it cannot, upon ordinary inspection and use, be distinguished from it, and that it is calculated and intended to deceive, not the purchasers in original packages, but the purchasers of small amounts at retail, and the consumers, into the belief that the article is in fact butter, is clear beyond doubt."

The decision of the Minnesota court, while it will have its effect in establishing the validity of laws requiring that oleomargarine shall be made of some distinguishing color, also conveys a valuable lesson to the Dairy and Food Commissioners of the various states. In this case the Dairy Commissioner seized and confiscated the oleomargarine which was involved in the suit without any procedure through the medium of a court, and the suit was brought by the Armour Packing Company to recover damages for the seizure. The court gave judgment against the Dairy Commissioner and in favor of the Armour Packing Company in the amount of $2,182.00 and the costs of suit, solely because the mode of procedure in the condemnation and confiscation had not been regular and through the medium of the proper court. The judge held that while the state had an undoubted right under the law to seize and confiscate the goods under consideration, this act could only be accomplished in a legal manner, and that a summary confiscation was not legal and would not be allowed.

ANALYSES OF COMMERCIAL FERTILIZERS.

The act of June 28, 1879 (section four) provides that "it shall be the duty of the Board of Agriculture to analyze such specimens of commercial fertilizers as may be furnished by its agents, such samples to be accompanied with proper proof, under oath or affirmation, that they were fairly drawn," and the act of March 13, 1895, transfers this duty to the Secretary of the Department of Agriculture.

As Secretary of the State Board of Agriculture, and more recently as Secretary of Agriculture, I have given my personal attention to the enforcement of the provisions of this act, and have at all times supervised the selection of samples, the analyses and the reporting of all analyses to manufacturers and others interested. The analyses are made by Dr. Frear, of the State Experiment Station, and are paid for under the provisions of section fifth of the act of June 28, 1879.

During the past year the special agents of the Department have sent in 1,514 samples, selected in all portions of the State and under all possible conditions, from the warehouse at the railroad station, from the grain drill of the farmer, from his barn and, in fact, from all possible localities and positions. They have been selected by men not in any way interested and under oath or affirmation, as required by law. I am fully satisfied that they fairly represent the fertilizers which are being sold to consumers in our State. Of these samples 1,482 have been officially tested and reported upon and copies of the analyses sent to the manufacturers and published and distributed in bulletin form for the benefit of the consumer.

As has been the case heretofore, the year is necessarily divided into two distinct portions, which embrace the fertilizers intended for the spring and fall trade. Many manufacturers send out brands for the spring trade which differ in name and composition from those intended for application to wheat and other autumn crops, and from five to seven special agents have been employed in the selection of samples.

Following this division of the year, I find that during the Spring portion, commencing April 1st, and ending May 15th, 550 samples were selected and are found with selling prices attached, in the following table:

Kind of Fertilizer.	Number of Brands.	Average Selling Price.
Complete fertilizers,	383	$24 02
Dissolved South Carolina Rock,	73	12 52
Ground bone,	57	27 44
Alkaline fertilizers,	26	15 66
Dissolved animal bone,	4	23 50
Muriate of potash,	2	40 38
Nitrate of soda,	2	46 63
Kainit,	2	12 88
Ammonite,	1	35 75
	550	

During the fall or second portion of the season, the selections amounted to 964 samples divided as follows:

Kind of Fertilizer.	Number of Samples.	Average Selling Price.
Complete fertilizers,	572	$23 03
Dissolved South Carolina rock,	174	12 32
Ground bone,	102	27 11
Alkaline fertilizers,	68	15 68
Dissolved animal bone,	23	23 78
Muriate of potash,	4	34 44
Kainit,	2	12 12
Bone black,	2	22 50
Ammonite,	1	35 75
	948	

By combining the two seasons and considering the year as a whole, we have the classified results as follows:

Kind of Fertilizer.	Number of Brands.	Average Selling Price.
Complete fertilizers,	955	$23 54
Dissolved South Carolina rock,	247	12 43
Ground bone,	159	27 29
Alkaline fertilizers,	94	15 62
Dissolved animal bone,	27	23 64
Muriate of potash,	6	37 41
Kainit,	4	12 50
Bone black,	2	22 50
Ammonite,	2	35 75
Nitrate of soda,	2	46 63
	1,498	

During the year 1897 licenses were granted for 967 distinct brands of fertilizers, all of which were offered for sale in our State. As compared with 1896, the work of recording and licensing fertilizers shows the following totals:

Kind of Fertilizer.	1896.	1897.
Complete fertilizers,	627	619
Dissolved South Carolina rock,	126	121
Ground bone,	109	113
Alkaline fertilizers,	69	87
Dissolved animal bone,	23	27
	954	967

With the number of agents, all working independently, there is, of course, more or less duplication of samples, especially of the leading brands; these samples, however, usually come from different portions of the State. In order to obtain a fair average test of the fertilizer as represented by the whole of these samples, Dr. Frear was requested to make "composite" samples by mixing all of the same brand and obtaining the composite sample from the mixture. This rule was applied to all samples of which there were two or more and in this manner 173 composite samples were obtained and tested. In making these, 465 distinct samples were used, the greatest number of any one brand being six.

There is probably no one of the numerous duties assigned to the Department of Agriculture which yields to the farmers of our State such immediate results at so little cost to them. It is estimated that we annually expend not less than $3,750,000 for fertilizers controlled by this law, and it is estimated that its results give our farmers a saving of ten per cent., or $375,000 per year. Inasmuch as the whole cost of the work is paid by license fees from manufacturers, the law is practically self-enforcing and causes no expenses to the taxpayers of the State.

FERTILIZER SUPPLIES.

When the act of June 28, 1879 (to regulate the manufacture and sale of fertilizers) became a law, farmers had not commenced to mix their own fertilizers but in anticipation of the fact that such a time would probably arrive, the law was so drafted that it would cover the case.

Section first of the act provides: "That every package of commercial fertilizer sold, offered or exposed for sale for manurial purposes within this Commonwealth, shall have plainly stamped thereon the name of the manufacturer, the place of manufacture, and an analysis stating the percentage therein contained of nitrogen, or its equivalent in ammonia, in an available form, of potash soluble in water, of soluble and reverted phosphoric acid, and of insoluble phosphoric acid: Provided, That any commercial fertilizer sold, offered or exposed for sale which shall contain none of the above named constituents shall be exempt from the provisions of this act."

Section sixth provides that: "The term 'commercial fertilizer' as used in this act, shall be taken to mean any and every substance imported, manufactured, prepared, or sold for fertilizing purposes, except barnyard manure, marl, lime, and wood ashes, and not exempt by the provisions of section one of this act."

During the past year there has been a considerable increase in the use of home-mixed fertilizers and large amounts of nitrate of soda, sulphate of ammonia, sulphate of potash and similar single ingredient materials have been purchased by our farmers for the purpose of compounding their own fertilizers.

The trade has increased to such an extent that it would seem that this class of purchasers were entitled to as much and the same protection as those who purchase their fertilizers ready mixed. They are quite as liable to imposition in the composition of each ingredient as the other class are in the mixed goods, and it has been the desire of the Department to extend to them all possible and legal protection.

These "fertilizer supplies" are composed of one or more of the following ingredients as named in the act alluded to: Nitrogen or ammonia in an available form, of potash soluble in water, and of soluble and reverted phosphoric acid and of insoluble phosphoric acid," and are clearly within the limits of the first section of the law and are certainly not exempt under the sixth section, and the Department therefore held that they should be licensed and recorded according to law, and that they should be branded or marked in accordance with the provisions of its first section, as quoted above, but in order that there might be no mistake about it, the opinion of the attorney General was asked.

In reply to my statement of the question, the Deputy Attorney General gave the following opinion:

Harrisburg, Pa., August 10, 1897.

Hon. Thomas J. Edge, Secretary of Agriculture, Harrisburg, Pa.:

Dear Sir: This Department is in receipt of your communication of recent date asking for instructions upon the question whether certain chemical compounds sold for fertilizing purposes should be branded

as required by the acts of 1879 and 1895. It seems very clear to me that the two acts above mentioned are intended to require such a marking of the packages or bags in which fertilizers are sold as will ensure protection to the purchaser thereof. Whether the fertilizers are mixed and sold by regular manufacturers, or are purchased in their chemical constituents and mixed afterwards, I think is not material so far as the proper marking of the packages or bags is concerned. It is the intention of the law to give proper notice to the purchaser of fertilizers of the constituents therein contained, and this can only be accomplished by requiring that all packages or bags containing fertilizers should be properly marked. It is my opinion that the Department is entirely right in its view of this question.

Very respectfully yours,

(Signed.) JNO. P. ELKIN,
Deputy Attorney General.

Manufacturers of mixed fertilizers have, with some reason on their side, claimed that it was unjust that they should be compelled to license their mixed fertilizers and that those selling fertilizer supplies should be allowed to sell their goods on the old plan without a guarantee as to their composition or purity, and instanced the fact, already known to the Department, that, fertilizer supplies, known under exactly the same trade name, but varying considerably as to their value, were upon the market and were being purchased by farmers for the purpose of compounding their own fertilizers.

After a correspondence with some of the leading manufacturers of commercial fertilizers, not only in this State but also at the fertilizer centres of the county, it was found that dealers in such supplies outside the State claimed that the inter-state commerce law protected their sales in Pennsylvania, and that the "original package decision" protected their sale after arrival in the State and until they reached the consumer.

In arriving at such a conclusion the dealers have probably failed to note the difference in the action between the ordinary trade regulations of a state and its police regulations; the act which regulates the manufacture and sale of fertilizers is a police and not a trade regulation, and it is claimed that, while it will not affect sales made from points outside the State to dealers or consumers in the State, it will not protect any sale made in the State, and that its protection ceases with the first offer to sell or sale made in the State.

This reasoning applies with equal force to goods brought into the State from foreign countries or imported goods; as soon as they cross the State boundary and are offered for sale in the State, they are subject and are regulated by the police laws of the State, and that while sales can be made, from points outside of the State direct to the con-

sumer, they cannot be legally made within the State lines until the provisions of the act for their regulation are complied with.

In the case of imported fertilizer supplies, it is found that each particular kind is usually controlled by one firm or company and hence one license taken out by that firm or company will cover all unless made by the firm, either direct or through other dealers in the State, and hence the trouble and expense of a compliance with the provisions of the law will be reduced to a minimum.

Believing that the position taken by the Department is in strict accordance with the requirements of the law and in the line of protection to the consumer, the Department will hereafter notify dealers, to whom notices are annually sent, of the decision of the Deputy Attorney General and of the claims of the Department, and it is believed that a general compliance will be found to follow.

SAN JOSE SCALE.

It is one of the wise provisions of nature that all of our insect pests except perhaps in a few of our most recent importations, are held in check by insect and fungoid enemies, and it is seldom that this balance of power is destroyed; occasionally from some cause not yet well explained, the pest, possibly through the absence of its enemy, obtains the mastery and the maximum of loss is again experienced, but this seldom is found to take place two years in succession, and the year following such an outbreak is usually signalized by the unusual absence of the pest and the corresponding abundance of the crop thus affected.

When the Hessian fly was imported at Trenton and first became known in the wheat fields of surrounding New Jersey, it was stated that farmers in this country would be compelled to abandon the cultivation of wheat; the fact was forgotten that in Europe, where they had known the fly for many years, good crops were still annually harvested in spite of its attacks. In a short time our farmers found from experience and observation that late seeding was the proper remedy, and since this has been generally adopted the loss has been reduced to a minimum.

When the potato patches of our western settlers joined those of the wild potatoes of Colorado the "Colorado potato beetle" at once improved the opportunity and rapidly passed eastwards, and we had a repetition of the experience of our New Jersey farmers with the Hessian fly of revolutionary times. For a time it appeared that we would be compelled to abandon the cultivation of the potato, but soon one

enemy, and soon after another, overlook and attacked the potato bug; first they were found dead in the patches with a greater or less abundance of fungoid growth in and around their bodies, and a short time after, were found killed in large numbers by an exceedingly minute louse or parasite. About this time or earlier, it was found that applications of Paris green, in mechanical solution, would prevent the ravages of the beetle and it was at once resorted to by our more progressive farmers, and soon by nearly all who attempted to cultivate the crop. Since then the injury committed has been reduced to its minimum and one of our largest potato growers stated, at one of our farmers' institutes, that the beetle had been a blessing to him and had been the means of his making a large amount of money upon the potato crop; his neighbors did not fight the beetle and he did, and thus had an open market for his crop.

So firmly was I impressed with this condition of affairs that, in my report of last year I used the following language:

"All of our fruit and farm crops are subject to injuries resulting from the introduction of insect pests and fungoid diseases, but their history, thus far, without exception, has been that for a few years they inflict a maximum amount of injury, but that after a short term, their natural enemies overtake them and the injury is reduced to a minimum, which is only interfered with when, from some unexplained cause, these natural enemies are present in smaller numbers, and thus fail to hold the original insect in check. The maximum of injury seldom occurs two years in succession and the succeeding season is marked by a limited number of insects."

During the recent meeting of the Society of Economic Zoologists, at Detroit, Prof. P. H. Rolfs, of the Florida Experiment Station, called the attention of the society to the fungoid enemies of the San Jose scale, and gave a full and interesting account of his propogation of the fungous growth and the subsequent rapid destruction of the scale by its dessemination.

Prof. Rolfs informed the convention that his attention had been called to the fact that the scale was, at least in spots, disappearing from the orchard of Dr. Funiak; several reasons were assigned to ac count for this destruction of the scale; some contended that it was due to the hard freeze of two or three years previous; the unusual condition of the weather was also suggested as a cause with which to account for the effect; others claimed that the death of the insects might be attributed to a severe drought which prevailed in that portion of Florida at that time.

After that careful examination which always goes with the training received by those who are employed at our Experiment Stations, Prof. Rolfs was convinced that the peculiar condition of these somewhat isolated spots was due to some natural enemy which had destroyed the scale so far as its effects extended.

Reasoning from the usual character of fungoid diseases, Prof. Rolfs removed branches with the diseased scale insects, to orchards in which the scale was not yet diseased, and tied them close to and parallel with the limbs most thickly inhabited by the scale; of the result Dr. Rolfs writes as follows: "The orange colored prominences could be detected on many scales within twenty inches of the infested stick, and the stick had not (after the lapse of six weeks) lost its virtue."

Dr. Rolfs next step was to devise some means by which this fungoid enemy could be rapidly and cheaply propogated in cultures and thus prepared for dissemination to any point at which the San Jose scale existed. Bread which had been purposely prepared and soured was selected as the material in which to produce and increase the spores of the fungus, and the results were all that had been expected. Several other mediums were tried; the usual one of gelatin was tested, but given up for the acid bread; potatoes were also given a trial, but nothing gave as satisfactory results as the bread.

After the propogation of the spores had been brought to a point of success which warranted further steps, a series of experiments were instituted in which plum, peach and other infected trees were "inoculated" by the spores on the bread preparation.

Dr. Rolfs thus reports the results of these tests:

1. That so many of the experiments turned out favorably, substantiates the former expectation that the material might be grown artificially.

2. The material can be produced in great quantities, and its applica tions to insects is as easily accomplished as a single spraying with an insecticide.

3. It is more thorough than insecticides.

4. While it is nature's own remedy for striking a balance in Florida, it will doubtless be less effective in other localities and in dryer climates.

5. The orchardist who may not be a scientist can apply it properly.

6. The fungus is widely disseminated on a native scale, insuring a constant source of new material.

7. The fungus multiplies many fold more rapidly than the San Jose scale.

8. The rain washes the fungus and dead scale from the trees, leaving no sign of the tree having been diseased, except where the scale have done injury.

Dr. Rolfs states that the spores of these fungi, especially in a damp and moist time, multiply with wonderful rapidity, and if they once obtain lodgment will keep in advance of the San Jose scale and sooner or later either destroy or hold it completely in check. Under but moderately favorable conditions the spores begin to increase with great

rapidity in six weeks after the inoculation, but under more favorable surroundings, the effect is shown in much less time.

The spores of this fungus, as is the case with most of its class, passes through various stages of growth, in none of which it is capable of withstanding any reasonable amount of drought; in another it seems to be able to bear without injury very low temperatures, and that, during certain seasons its multiplication, naturally is not confined to insects as a media but is carried on through surrounding objects of its own selection.

In summarizing the results of his experiments and of his experience with fungus growth, generally, Dr. Rolfs, writes thus:

1. It has been definitely established that insects are subject to disease.

2. Diseases of insects have been, and are being employed to destroy insect pests.

3. Some diseases of insect pests may be disseminated artificially with profit.

4. This disease of the San Jose scale is present on at least three continents and in many countries. In several instances it is recorded as an important factor in controlling scale insects.

5. It is doubtless a native of Florida, as it occurs on native scale, in our hammocks.

6. This fungus may be transferred to trees infected with San Jose scale and a disease produced among the scales.

7. Large quantities of material may be produced in the laboratory in a short time and at a slight expense.

8. The laboratory grown material may be applied successfully by fruit growers.

9. This fungus cleared orchards more effectively of San Jose scale than could have been done by many sprayings.

10. It is now being tested north and south.

There appears to be a wide difference of opinion among practical entomologists as to the possibility of preventing the ravages of the San Jose scale; Prof. J. B. Smith, of the New Jersey Experiment Station, writes: "It has been charged, and not without some show of reason, that entomologists and some others are losing their heads in the matter of dealing with this insect (San Jose scale), and that there is an unnecessary and somewhat hysterical excitement created by an overabundance of lurid talk accompanied by an absence of careful study and work. The charge is not without some show of reason, for, after all, what basis is there for all the fuss that has been made? It is about time that the subject was considered carefully and without excitement, lest the reaction, when it comes as it inevitably must, destroy confidence in the warnings of the entomologist altogether."

Mr. Smith also states that the San Jose scale is not any more diffi-

cult to kill than some of our native scales, and that "on some trees infested by both San Jose and "scurfy" scales winter treatment killed nearly all the pernicious form (San Jose), while the trees are now coated with the common species which the application left unharmed."

Prof. Smith gives the following mode of treatment with which he has had practical experience:

"After January 1, and at any time before the trees become in the least active, spray with pure kerosene of the ordinary 150 degree test. Be thorough, but not wasteful; use enough to make a film of kerosene capable of penetrating into the smallest crevice; but let that film be of the thinnest posible description. Do the work on a dry, bright day with enough air stirring to favor rapid evaporation and do it yourself, or at least superintend, so that carelessness in the application be not charged against the insecticide as inefficiency."

Prof. Smith states that on smooth barked trees whale oil soap, at the rate of two pounds to one gallon of water will do almost as well, but that it will not answer on rough bark trees.

Of this treatment with kerosene Dr. Webster of Ohio writes: "The San Jose scale is not spreading in Ohio so far as I know, but is being exterminated wherever its introduction has become known. In two orchards near New Richmond, Ohio, kerosene in an undiluted form has been used with marked success, both last year and this, without the least injury to the trees, either apple or peach. I am unwilling to recommend this treatment for general use as yet, but the results gained as against the San Jose scale are so valuable that I give the details with the hope that equally good results may be obtained elsewhere during other years."

In writing to a correspondent who has used the kerosene, Dr. Webster received a reply from which the following is an extract:

"The kerosene (clear coal oil such as we use in our lamps) which we used, was applied principally in the month of February when the ground was frozen. We applied it with a small varnish brush to some small trees, to the entire tree and on others only to the limbs that were most affected. My brother used a barrel sprayer, applying forty gallons of pure coal oil on 500 apple trees and fifteen peach trees. A part of the orchard he sprayed a second time."

The informant further adds that the trees, to which an application was made two years ago, are in excellent condition, have made fine growth and are as smooth as if varnished.

BRANDING CHEESE.

The act of June 23, 1897, which went into effect August 23, provides, by its second section, as follows:

"All cheese manufactured or sold within this Commonwealth shall be divided into five grades, and shall be branded or stenciled, in ordinary bold faced letters, not less than one inch in height, on two sides of each cheese, and upon the top and bottom of the box or case containing the cheese, the manufacturer's name and postoffice address and the words "Full Cream," "Three-fourths Cream," "One-half Cream," "One-fourth Cream," and "Skimmed Cheese." All cheese branded "Full Cream" shall contain not less than thirty-two per centum of butter-fat as may appear by proper test. All cheese branded "Three-fourths Cream" shall contain not less than twenty-four per centum of butter-fat as may appear upon proper test. All cheese branded "One-half Cream" shall contain not less than sixteen per centum of butter-fat as may appear upon proper test. All cheese branded "One-fourth Cream" shall contain not less than eight per centum of butter-fat as may appear upon proper test. And all cheese containing less than eight per centum of butter-fat, as may appear upon proper test, shall be branded "Skimmed Cheese."

The provisions of this section place unnecessary work upon the manufacturers of and dealers in cheese, and its provisions are not made sufficiently clear. During the time the law has been in effect the Department has had more or less trouble in getting the manufacturers and agents to brand their cheese so that it is not removed by the retail dealer before the cheese is cut. Many of both classes claim that the only sides of the cheese were the circular edges and therefore they place their brand directly upon the band which surrounds the cheese; this was removed by retail dealers before the cheese was cut and hence more or less trouble occurred between the agents of the Department and the dealers in reference to the questions as to whether the cheese had been properly branded or not. It was claimed by the officers of the Department that the top and bottom were just as much "sides of the cheese" as were the circular portion, and hence all dealers were requested to notify manufacturers to brand their cheese near the centre, on the top and bottom, and thus allow the retail dealer to have a portion of the brand upon the last piece left in his hands.

This section also places unnecessary labor and trouble on both manufacturer and dealer by making too many grades of cheese; the laws of nearly or quite all other states require but two grades, and

anything which does not come up to the standard of "Full Cream" is classed as a "Skimmed Cheese," the dividing point between the two being thirty-two per cent. of butter-fat.

The effect of this provision is to reduce the number of grades.

The adjoining States of New York and Ohio, from which our dealers obtain the bulk of the cheese sold in the State, have excellent laws governing its manufacture and sale, and their provisions are such as to remove a large proportion of the unnecessary hardship and labor entailed upon dealers by our law. The laws of the two states make but two grades and establish thirty-two per cent. of butter-fat as the line which divides them; any cheese guaranteed up to thirty-two per cent. of butter-fat is considered a "Full Cream Cheese" and anything that is not and cannot be guaranteed to this limit is a "Skimmed Milk Cheese," and the purchaser buys it at his own risk, for a skimmed milk cheese only.

The law of New York (section 33) provides that "Every manufacturer of "full milk cheese" may put a brand upon each cheese indicating "full milk cheese," and the date of the month and year when made, and no person shall use such a brand upon any cheese made from milk from which any of the cream has been taken. The Commissioner of Agriculture shall procure and issue to the cheese manufacturers of the State, on proper application therefor, and under such regulations as to the custody and use thereof as he may prescribe, a uniform stencil brand bearing a suitable device or motto and the words "New York State Full Cream Cheese." Every such brand shall be used upon the outside of the cheese and upon the package containing the same, and shall bear a different number for each separate factory."

In the application of this law the Commissioner of Agriculture provides uniform brands on which the number is left blank, and when an application is entered the appropriate number is cut on the brand and one sent to the manufacturer who makes the application.

Under this system any cheese may be traced by its factory number and the objections so vigorously urged by wholesale dealers that our State brand "gives their business away" is removed and the consumer equally as well secured in his rights.

The question of the right of our State to require that a manufacturer of cheese in Ohio or New York shall put his name and address on his cheese has been raised under the inter-state commerce law, but it has been definitely decided that the effects of the inter-state commerce law only protect the cheese to the first dealer or other person who offers it for sale in our State. This causes no little difficulty when an unbranded New York or Ohio cheese reaches the wholesale dealer in this State. The laws of New York and Ohio cannot compel a cheese which is to be sent to Pennsylvania to be branded in any particular manner, for it would be an unwarranted interference with the inter-state com-

merce act, but the Pennsylvania law will compel the dealer in our own State to see that the cheese is properly branded before he offers it for sale.

If our State law could be amended so that the brands of New York and Ohio could be accepted as a compliance with our own law, it would save much trouble and expense to wholesalers in this State, and at the same time protect the interest of the consumer quite as well; but in any event our law should be amended so as to correspond with those of Ohio and New York, at least in the style and number of grades of cheese made, and our next Legislature should see to it that our present law is simplified both as to its application and results, and so arranged as to inflict less expense and annoyance to dealers and retailers of cheese in Pennsylvania.

Before the date at which the law went into effect, meetings of the dealers in cheese in Philadelphia and Pittsburgh were held and were attended by the Dairy and Food Commissioner and myself; it was the desire of the dealers that they should be allowed to place their name and address upon the cheese and boxes, instead of that of the manufacturer who, in many cases at least, was located outside the State and unknown to those who proposed offering the cheese for sale. The officers of the Department expressed their willingness to make the enforcement of the law as easy and clear as was consistent with the interests of the consumer. A meeting of the representatives of the Philadelphia cheese dealers was held in the office of the Attorney General, and the whole matter of the enforcement of the law discussed, and that portion in regard to branding particularly presented; after due consideration the Deputy Attorney General rendered an opinion of which the following are the leading features:

"1. That, in case of cheese manufactured in Pennsylvania, you should require the same to be branded 'Full Cream,' 'Three-fourths Cream,' &c., as the case may be, and with the name and address of the manufacturer thereof."

"2. That, in case of small cheese, you should require the words "Full Cream,' 'Three-fourths Cream,' &c., to be printed in large letters and allow the name and address in smaller type, which, however should be clear and plain and which ought not to be less than one-half inch in height in any instance."

"3. In the case of cheese manufactured outside of the State, it would be sufficient compliance with the act of Assembly above named, if the dealer would brand the same in the manner indicated, with his name as dealer thereon, and with his address or place of business also thereon. I am fully convinced that in this way complete effect would be given to the act and the interests of the consumers as well as the Commonwealth would be best protected."

NITRAGIN OR NITRIGINE.

The correspondence of the Department indicates that some of our farmers are becoming interested in this new candidate for agricultural favor, and it is to be regretted that, at least so far as this country is concerned, but little is known of its practical value, and not sufficient to warrant even a guess as to the results of its use.

It has long been known that, in some unexplained manner, clover and other members of the same family had the power of converting the free nitrogen of the air into forms in which it could, in some manner through the soil, be utilized as plant food, and it was equally well known that our ordinary grain crops did not possess this power but must, in great measure, depend upon nitrogen supplied through yard manure or commercial fertilizers.

It is now claimed that this class of plants have this power of action upon the free nitrogen of the air through bacteria which, under certain conditions and surroundings, collect among and around their roots.

It is claimed that these bacteria are present in what are termed rich soils and absent in poorer ones, and that, if not naturally present, they may be added artificially through the medium of preparations known as "Nitragin," or "Nitrigine." The theory at present receives its main force from the fact that the names of two foreign scientists of high degree (Nobbe and Hiltner) are associated with it.

The circulars through which "nitragin" is advertised, contain the following statements:

"1. Every single seed is surrounded with bacteria, which, after, germination, penetrate the roots, hairs and commence their role as collectors of nitrogen, so that a good crop is secured in the poorest soils without the use of nitrogenous manure.

"2. Through the storage of nitrogen by the bacteria, the soil itself becomes richer in nitrogen in an available state, to the advantage of other crops grown in rotation.

"3. The disadvantage of the mode of inoculation previously adopted is avoided.

"4. Manuring with nitrogen in the form of saltpetre ammonium salts, etc., is absolutely unnecessary."

Prof. Damascaux, of the Agricultural Institute of France, furnishes us with the following condensed answer as to what this new agent is and what it will do:

"The patent preparation named by Nobbe and Hiltner "nitragine,"

containing pure colonies of bacteria suitable for encouraging the combination of nitrogen of the air by leguminous plants (of the bean and pea family, including red clover) is erroneously called a bacilliary fertilizer. It is not a fertilizer in the strict sense of the term, but is a preparation containing minute living beings whose office is to convey to the soil, into which they are inoculated, the aptitude to produce clover, vetch, lupine, etc., etc.

"Whatever may be the manner of application, the object is to surround every seed with a colony of suitable bacteria, which, after germination, penetrates the root hairs and collects the free nitrogen of the air, so that, by their help, a good crop can be secured in a soil very low in nitrogen. In this way also the soil is enriched in available nitrogen through the storage of nitrogen by the bacteria, thus profiting the crops that follow, and diminishing the expenses due to providing the necessary nitrogen fertilizers."

Prof. W. A. Buckhout, of the Pennsylvania State College, in a paper prepared for the Department, thus alludes to this power possessed by red clover and crops belonging to the same family:

"While the structure and action of roots are in the great majority of plants such as have here described, there is one particular family, represented by such familiar kinds as the pea, the bean, the clover, etc., in which an entirely new feature appears, which, in the light of recent knowledge, is of unusual importance, and fits those plants which possess it to become singularly useful to mankind. It is their ability to form small nodules or tubercles. They appear early in the life of a root and under all ordinary circumstances. They are believed to be caused by microbes, perhaps a separate kind for each plant. The irritation produced in the root by these exceedingly minute organisms (for they are altogether too small to be seen except by the high power miscroscope) causes a wart-like enlargement, which soon comes to be much larger than the root itself. Within this tubercle the microbes live and thrive. Its cells soon become filled with them. In some way difficult to explain, if, indeed, it can be said to have been explained at all, they open up to the plants upon which they are growing the nitrogen supply of the atmosphere, and enable them to take and use it. Since other plants are thought not to have this power, it is obvious that all which bear these tubercles upon their roots have a great advantage and should have a large place in cultivation.

"They should require less aid from fertilizers and should be important members of any rotation. It thus becomes easy to understand the special value of clover, beans, peas and the like. They are not only valuable food-producing plants, but they tap sources of food not otherwise obtainable, and, whether used directly as food or merely for green fertilizers, they capture and fix the element, nitrogen, which is of prime importance to life and growth.

"It is the endeavor to hasten and make more certain the production of these tubercles upon the roots of leguminous plants and thus reap the benefit which accrues, that has led to the recent proposition to inoculate soils, particularly such as are new to cultivation or have been found ill adapted to growing tubercle bearing plants. The material used for such inoculation—called "nitragin" —is to be derived from the special cultivation of the tubercle microbes in particular media, such as gelatin, as is commonly done in bacteriological laboratories, thus securing a solution rich in them, so that when applied to the soil they shall be there in such numbers and activity that the roots of the young plants will become quickly infected, and thus their vigor enhanced by the nitrogen of the air unlocked for their use. Time and experience alone can tell how practicable is this method which theoretically commends itself."

In this, as in every new thing pertaining to agricultural improvement, we find the French agricultural chemists leading the van, and the French agricultural press contain advertisements of the new agricultural agency, which has as yet scarcely been tried in this country.

Such advertisements give explicit directions for the application of the new element. The proper kind for each plant is offered for sale in bottles, marked with peculiar colored labels for each crop, and accompanied with plain directions for its use. They also direct attention to the failure which will follow the use of the material prepared for one crop on another. The contents of the bottle must be carefully protected from any great increase in temperature, for it is found that much above the heat of the human body endangers the life of the bacteria.

The contents of the bottle, diluted with warm water, are to be carefully poured over the seed to be acted upon, and it is carefully stirred until every particle of the surface of the seeds is touched with the liquid, and the seed then sown and covered in the usual manner after sowing and before the heat of the sun has had time to injure the bacterial life. In some cases it is advised to dry the moistened seeds with a small portion of dry earth, but in other cases no account is made of this protection.

Prof. Duggar, of the Alabama Experiment Station, after a series of experiments with "nitragin," thus explains the theory of its effects and action:

"Nearly every genus of leguminous plants has its own specific "adapted" germ, which, if present in the soil or on the seed sown, is able to cause the development of these tubercles and to secure to the plant the consequent advantages. As a general rule, to which there are exceptions, the germ which induces the growth of tubercles on one legumen is unable, at least temporarily, to produce tubercles on plants belonging to other genera; for example, the germ which causes tu-

bercles on clover is impotent on vetch. Hence, for the thrifty growth of a given legumen, say clover, the soil must contain the corresponding form of germ life. If this 'clover germ' is absent, the only way to successfully grow clover on poor and medium soils is to use liberal quantities of nitrogenous fertilizers, an expensive operation. If the proper germs are present and if all other conditions are favorable, as drainage, proper mechanical condition and a sufficiency of phosphoric acid, potash and lime, clover plants will thrive and be largely independent of the soil nitrogen, drawing a large part of their supply from the atmosphere.

"Are most soils naturally stocked with the micro-organisms necessary to the thrifty growth of every kind of cultivated leguminous plants? Our experiments, of which a part are recorded in this bulletin, show that in some southern soils the germs essential to the thrifty growth of certain legumens are wanting or else present in insufficient number. Their absence from many southern soils explains why the opinion is so prevalent that in some localities that the clovers are not suited to the extreme south."

The fact that the experiments of the Alabama Station were nearly all conducted with species of the legumen family not cultivated in the north, robs their results of much of their value to us, but enough has been proven to show that the experiment is worthy of further investigation, and no doubt our northern experiment stations will take the matter up and test the theory upon the more commonly cultivated clovers and leguminous plants.

BEET SUGAR.

Correspondence from Montgomery, Cumberland, Greene, Wayne and Erie counties indicates that the question of the production of beet sugar in Pennsylvania is again attracting attention and that there is some disposition on the part of the farmers to make an examination into the question of cost and profit, and it is to be regretted that the Department is not in the possession of any recent data from which to furnish information.

In 1877 a similar interest was shown in Chester, Delaware and other southeastern and southern counties of the State, and the writer then, as the representative of the State Board of Agriculture, was in a position to be able to give some assistance in the way of analyses of samples of beets of different kinds grown under the same conditions

and of different kinds grown under different conditions. Over forty analyses were made of samples raised on the Eastern Experimental Farm, in Chester county, and by members of the Experimental Farm Club, which met there.

Of the theory of sugar beet production (for the sugar only) Prof. Goessman writes as follows: "The rules by which beets are successfully raised for feeding purposes do not apply to a successful production of the beet for sugar. In the first case quantity is the main aim; in the second, besides quantity, a good quality is essential. A good sugar beet is expected to contain not less than twelve per cent. of sugar, a small percentage of saline substance and the least possible amount of nitrogenous constituents. The more nitrogenous compounds there are present the less sugar will be noticed, for they exert a controlling influence on the formation of sugar in growing beet sugar. The saline substances, on the other hand, do not affect injuriously the formation of sugar, yet they place it under very disadvantageous circumstances, as far as its final separation in a crystalized form is concerned. They favor the production of molasses, and thus increase the expenses of manufacture. The history of the beet sugar industry of later years is not without many illustrations of these damaging experiences. Some late experiments in this country no doubt owe their failure, in part at least, to the fact that virgin soil, rich in vegetable mold and saline constituents has been used for the cultivation of the sugar beet. Judging from analogy, we cannot but consider the reported gigantic roots and unusually large crops per acre as unfavorable features of some recent attempts in beet sugar manufacture."

Although I have watched the various attempts to make the production of sugar from the beet profitable during the past twenty years, I have thus far received no information which leads me to very materially alter or amend the opinion expressed in my annual report of 1877 to the State Board of Agriculture (page 201). It is true that the introduction of centrifugal and other improved machinery may have so altered the relative conditions so as to reduce the cost of manufacture, but experiments will soon demonstrate this. It is also possible that, by a careful selection of seed and soil we can so increase the percentage of sugar and decrease that of impurities as to make the crop profitable, but thus far no practical experiments in our own State have proven this.

In 1877 I wrote as follows:

"It has been demonstrated that if the percentage of sugar in the roots does not come up to a certain point, its manufacture will not prove profitable. Let us then first establish the fact that there are at least special soils in Pennsylvania which will grow beets having the required percentage of sugar, and next that its manufacture will pay.

and capital will not long be wanting. It will not do to assume that because this industry is found profitable in France and Germany, or even in California, that it will be equally lucrative in Pennsylvania. If mere bulk of roots was all that is needed we should have no fears of the success of the enterprise, but this is far from being the primary consideration. If, on the other hand, we attempt its manufacture from roots not rich enough in the sugar producing elements and depend upon State bounty to furnish the balance between cost and the actual market value of the sugar, we shall find that as soon as this aid is withdrawn the industry will fail. It would be better not to start at all than to commence upon a false basis and rear upon it a fabric which will eventually fall, if from no other cause, because of the insecure foundations. The assumption that Pennsylvania can grow beets rich in sugar is as yet unsupported by that kind of proof that is absolutely necessary before capital can be induced to lend its aid. We have no desire to discourage any attempts which have been made or which are being made to place this industry on the list with many others which have given our State her present position among her sister states, but it is our desire to have no false steps made."

In the same report from which the above quotation is taken, I find the following relating to the importance of the manufacture of sugar to the United States, written by Lea Pusey:

"In 1847 the gold mines of California were discovered, and the silver mines soon after. Since their discovery (up to 1877), the amount of both mined in that region is very near $1,000,000,000. It would be natural to suppose that from such a vast sum we would have retained an ample sufficiency. But such is not the fact. And why? One of the most prominent reasons is that during that period we have imported and consumed over $1,250,000,000 worth of sugar. While we have squandered our gold for sugar, France, by preserving, in a wise policy of the protection of this industry (beet sugar manufacture) for the national benefit, has for the last ten years produced sufficient sugar for home consumption, and now is exporting a large surplus, and without any mines of gold or silver, possesses to-day, according to the best authority, over $1,200,000,000 of the precious metals, of which $360,000,000 has been accumulated during the last seven years, and after paying an unprecedented indemnity to Germany within that time."

Recent experiments have proven that beets can be raised in this State which show over eighteen per cent. of sugar, but such cases are rather the exception than the rule, and from results attained within the past year in our own State, we infer that the average percentage of juice has not exceeded 12. The extremes reported by our Experiment Station are stated as being 18.8 and 6.85, the average being 12.45 per cent.

During the year 1877 the Eastern Experimental Farm Club met

semi-monthly at the Eastern Experimental Farm in Chester county; the club resolved to institute a series of careful experiments, having for their object the production of beets for sugar rather than for stock, and were promised the co-operation of the State Board of Agriculture in the work. A large amount of seed of different varieties was procured and distributed among its members and selected roots produced from this seed were sent to the State Board of Agriculture to be tested for their sugar contents. From the result of this test, as shown by the following tables, it will be seen that, taking Dr. Goessman's estimate of twelve per cent. as necessary for profit, the product was not sufficiently rich in sugar to warrant any attempt at manufacture. I have followed the table by a condensed statement showing just how much each crop represented in the test produced, and from the table following the report it will be noted that there was no trouble in obtaining a large crop of beets. The tables are as follows:

Number.	Kind of Seed	Per cent. of total solids in juice.	Per cent. of sugar in juice.	Per cent. of impurities in juice.	Per cent. of sugar and total solids.
1	Vilmorin,	15	11.4	3.6	76
2	Quidlinberger,	11	7.6	3.4	60
4	White Silesian,	10.5	6.9	3.6	65
5	White Silesian,	10.5	6	4.5	65
6	White Silesian,	10.5	6	4.4	57
7	White Silesian,	10	6.4	3.6	64
8	Imperial,	11	8	3	72
9	Imperial,	11	7.7	3	70
10	Vilmoron,	13	9.6	3.4	74
11	Quidlenberger,	10.5	7.7	2.8	73
12	Carter's Prize,	12.5	9.4	3.1	75
13	Breslau,	10	8.4	1.6	84
14	Carter's Prize,	10.5	6	4.6	57
15	Quidlenberger,	10	6.5	3.5	65
16	Imperial,	10	6.4	3.6	64
17	Vilmorin,	10	4.9	3.1	69
18	Breslau,	9	6.3	2.7	70
19	White Silesian,	10	5.5	4.5	55
20	Long Blood,	9	6.4	3.1	67
21	White Silesian,	9	5.2	3.8	58
22	White Silesian,	9.5	5	4.5	52
23	White Silesian,	10.5	5.5	5	52
24	White Silesian,	9	5.4	3.6	60
25	White Silesian,	8.5	4.7	3.8	55
26	White Silesian,	10	6.4	.....	.....
27	White Silesian,	11	6.7	4.3	60
28	White Silesian,	11	7.4	3.6	67
29	White Silesian,	10.5	7.8	2.7	74
30	White Silesian,	11	7.4	3.6	67
31	White Silesian,	10.5	6.9	3.6	65
32	White Silesian,	8	5.4	2.6	67
33	White Silesian,	11	6.9	4.1	63
34	Imperial,	7.5	4.1	3.4	54
35	White Silesian,	11	5.7	5.3	52
36	White Silesian,	10	6.4	3.6	64
37	Carter's Prize,	12	7.4	4.6	62
38	White Silesian,	9.5	5.2	4.3	55
39	White Silesian,	9.5	5.2	4.3	55

These samples were grown under the following conditions:

1. Grown by Charles Ramsey; sandy loam sub-soil; barn-yard manure, plowed under in the spring, bone in the row; previous crop for two years, melons; harvested, September 30.

2. Same soil and same treatment as No. 1.

4. William Rutherford; clay loam; barn-yard manure, plowed in; planted May 30, harvested, October 12.

5. N. J. Sharpless; agrillaceous loam, clay sub-soil; in potatoes previous year; twelve cords of barn-yard manure per acre, plowed in; planted May 28, harvested October 11.

6. N. J. Sharpless, same soil as No. 5; no yard manure; equal parts by bulk of bone, plaster and manure from chicken house, at the rate of one and one-half tons per acre; planted and harvested the same time as No. 5.

7. William Swayne; strong limestone loam; Coe's phosphate, manure from the chicken house and ground bone in equal bulk, at the rate of six hundred pounds per acre, harrowed in; planted May 11, harvested October 1.

8. Same as No. 7.

9. Same as No. 7, but no fertilizer.

10. Same as No. 9.

11. Same as Nos. 9 and 10.

12. Same as last specimens.

13. Same as last specimens.

14. Experimental Farm; micaceous loam, porous sub-soil; phosphate, plowed in; planted May 26, harvested October 13.

15. Same as 14.

16. Same as 14.

17. Same as 14.

18. Same as 14.

19. Same as 14.

20. Same as 14.

21. Experimental Farm, micaceous soil, porous sub-soil; fertilized with $10.00 worth of Challenge phosphate (High Grade rock).

22. Fertilized by Lenning's phosphate.

23. Fertilized by ground bone; cost $10.00.

24. Fertilized by sulphate of potash; cost $10.00.

25. Fertilized by muriate of potash; cost $10.00.

26. Fertilized by Popplein's truck phosphate; cost $10.00.

27. Fertilized by AA nitrogen; cost $10.00.

28. Fertilized by nitrate of soda.

29. No fertilizer.

30. Fertilized by Pacific Guano; cost $10.00.

31. Fertilized by sulphate of ammonia; cost $10.00.

32. Fertilized by Stockbridge's manure; cost $10.00.

33. C. C. Hood; clay loam; cropped with potatoes for two years; hog pen manure in the row; planted May 18, harvested October 11.

34. Same as 33.

35. David C. Swayne; clay loam, flint and slate; two years with corn; manure from chicken house.

36. George Balderston; clay loam; flint and gray stone, land thin.
37. Same as 36.

In order to test the comparative yields of the different varieties, Superintendent Carter gave each kind, as nearly as possible, the same treatment and management, and the following were the resultant crops:

Carter's Prize, ...	13 tons, 1,001 pounds.
Quidlinberger, ...	12 tons, 388 pounds.
Imperial, ...	10 tons, 33 pounds.
Vilmoron, ...	8 tons, 549 pounds.
Breslau, ...	9 tons, 1,162 pounds.
White Silesian, ...	9 tons, 724 pounds.
Long Blood Red, ...	5 tons, 887 pounds.
Yellow Globe, ...	7 tons, 1,240 pounds.

Prof. Goessman, at the time of the experiment, made the following statement: "Every cent of increase in the price of sugar (per pound) would be equal to $15.00 per acre, and every half cent increase in crystalized sugar from every hundred pounds of beets worked, would add 115 pounds to the yield and $8.05 additional per acre. These additions, to profit are by no means beyond reach, for the best management in Europe realizes them."

When the above statement was made beet sugar was valued at seven cents per pound, and an allowance must, of course, be made when the present prices are taken into consideration.

Fearing that, taking the price of sugar into consideration, Dr. Goessman's estimate of 12 per cent. might not suit the change in prices, I wrote to Dr. William Frear, chemist of the Department, and from his reply, take the following:

"If we would compete with Europe, we must make our sugar at as low a cost. Since the price of our labor is higher—much of the harvesting being performed by women and children at 15 cents per day, and men's labor in proportion—we must be able to work with as little comparative disadvantage as possible as regards other items of expense.

"It is, indeed, not needful that every beet should contain 12 per cent., but the average richness must be about the same here as in Europe.

"Mayer gives the average of the principal sugar countries of Europe as follows: Austria, 12.9 per cent.; France, 13.9 per cent., and Germany, 14.5 per cent.

Goessman is evidently not too high. There was a time when the high price of sugar made it possible to work 8 to 10 per cent. beets with profit, but that time is past.

"You are right in noting that only saccharine richness, but other

qualities are needful in a beet. Of the solids in the juice, at least 78 to 80 per cent. should be cane-sugar. The presence of much more than 20 per cent. (of the total solids) in the forms of material other than sugar induces undesirable decomposition of the sugar, and prevents much of the sugar from crystalizing."

One important item very often entirely lost sight of in estimates of the cost of beet sugar production is the effect produced upon the extraction of the sugar by the impurities which often exist in the juice. Accepting the statement that one per cent. of impurity will neutralize one per cent. of sugar, we may obtain some interesting results from the table representing the analyses of the roots raised during the experiment of the Experimental Farm Club, and the same reasoning will apply with equal force to experiments now being made. Comparing the results of the analyses of Nos. 12 and 13, we find that the former gave 9.4 of sugar and 3.1 of impurities; this, applying the above rule, would leave 6.3 for actual sugar produced. In No. 13 the percentage of sugar was 8.4 and of impurities 1.6; applying the above rule to this sample, it follows that there would be 6.8 left for actual sugar, thus showing that it is possible that a lower grade of beet or one not so rich in sugar (but above in impurities), may produce the most sugar, and hence, it follows that in the production of sugar for beets, we must study the comparative content of sugar and impurities and that, if safe results are to be attained, both must be considered together and that, if results are based upon sugar content alone, disappointment may follow and the experiment end in disaster.

As showing the extent to which this industry is followed in Europe, the following statistics of last year are interesting:

Germany—379 factories; 11,675,000 tons of beets grown on 930,372 acres, or at the rate of 2,348 acres to each factory.

France—950 factories; 5,411,484 tons of beets grown on 405,852 acres, or at the rate of 1,140 acres for each factory.

Austria—216 factories; 5,700,000 tons of beets.

Russia—277 factories, with 5,311,000 tons of beets.

In Germany, the average price paid for roots appears to have been $4.64 per ton.

BUTTER-FAT IN CHEESE.

The passage of the act of June 23, 1897 (to prevent fraud and deception in the manufacture and sale of cheese, etc.), brought a large amount of additional correspondence to the Secretary of the Depart-

ment. This, after classification, was reduced to the following topics, or items:

1. That it would be impossible for the wholesale dealer to comply with the requirements of the law with regard to placing the name and address of the manufacturer upon the cheese and box, because, in many cases, the dealer bought the cheese of a large number of factories and often did not know from which one a particular cheese came.

2. That the standard of 32 per cent. of butter-fat, for a full cream cheese, was too high, and could never be reached in the ordinary course and manner of manufacture.

3. That samples taken from different portions of the same cheese would show variations in the amount of butter-fat of sufficient amount to acquit or convict those charged with a violation of the law.

4. That different days' work by the same factory, even under as nearly the same conditions and surroundings as possible, would vary in their content of butter-fat sufficiently to convict or acquit offenders.

5. Nearly all grocers remove the band which is around the cheese before they cut, and if the cheese is branded, as required by law, on "two sides," the brand is thus taken off with the band and neither the customer nor the special agent of the Department has any proof of a compliance with the requirements of the law.

Several meetings of cheese manufacturers and dealers were held in different portions of the State and were attended by the Secretary of the Department for the double purpose of explaining the construction placed by the Department upon the law, and of obtaining the views of practical manufacturers of and dealers in cheese. At all such meetings the Department was able to meet the manufacturers and dealers fully half way in all essential particulars, and all concessions within the letter of the law were granted.

As an offset to the first claim, the Department argued that it was to the interest of the manufacturer to comply with the law, and that the probable result of the enforcement of the law would be that the retail dealer would only purchase of such manufacturers or wholesale dealers as did comply with the requirements of the law.

It was admitted by the Department that the provisions of the inter-state commerce law would prevent the application of this provision of the law to non-resident manufacturers, and that the decisions under the inter-state commerce act would protect all cheese made outside the State to its first sale or offer to sell within the State, but that, on the article being sold, or offered for sale in the State, either wholesale or retail, the provisions of the enactment of the Legislature would at once take effect and the seller become liable for the full penalty prescribed by the act.

This decision of the Department was based upon the decisions in

the cases of Commonwealth vs. J. Otis Paul, Commonwealth vs. Powell and Commonwealth vs. Schollenberger, in which it was decided, in effect, that the provisions of the inter-state commerce law protected articles to their place of destination in the State and to their first sale, or offer to sell, but that after that point, they became liable to the police regulations of the State Government. This view of the case having the endorsement of the Attorney General, it was given as the decision of the Department which would, so far as suits were concerned, rule until reversed by the courts by test cases under the cheese law.

The difficulty of branding the cheese of distant or non-resident manufacturers was admitted and its application to cheese importers from foreign countries was evidently a still stronger case of hardship. As applicable to the case of imported (foreign) cheese, the Department, with the advice of the Deputy Attorney General, ruled that the name and address of the wholesale dealer or importer would comply sufficiently with the spirit of the law.

In order to settle, in a practical manner, the question of fact as to whether the standard of 32 per cent. of butter-fat in a full cream cheese was impracticable, Profs. Aschman, Frear and Cochran were directed to have 100 samples of cheese selected in their respective districts and have them carefully tested for their percentage of butter fat, and it was agreed by all parties interested that the result of this test should be deemed conclusive. Before the test was made, the wholesale dealers receded from their claim and admitted that the presence of 32 per cent. of butter-fat was readily attained, and that in some cases an even higher rate would be found.

The results of the analyses of Profs. Aschman, Frear and Cochran are given, in detail, in the following tables, from which it will be noted that while a number of samples run below the full cream standard, there is evidence for the belief that they were in reality "skim-milk" cheese and would come under one of the lower classifications of the law, but few falling below that of "three-fourths cream," which requires the presence of 24 per cent. of butter-fat, and that none fell below the requirements of a "half cream cheese," which, according to the provisions of the act, must have not less than 16 per cent. of butter-fat.

The attention of the reader, in his examination of the tables, is called to the fact that the samples were selected in the open market from the counters of retail dealers, and no effort was made to distinguish between the full cream and skim-milk cheese, and that it is but fair to presume that a full proportion of the latter are represented in each of the three lists.

Analyses of Samples by Prof. F. T. Aschman, and Selected in Western Pennsylvania.

Number of sample.	Place of Selection.	Per cent. of butter-fat.	Number of sample.	Place of Selection.	Per cent. of butter-fat.
7571,	Pittsburgh,	30.16	7640,	Erie,	31.86
7572,	Pittsburgh,	34.51	7641,	Erie,	33.27
7573,	Pittsburgh,	37.91	7642,	Erie.	30.61
7574,	Pittsburgh,	35.29	7634,	Erie,	34.76
7575,	Pittsburgh.	34.86	7644,	Erie,	27.48
7576,	Pittsburgh,	35.22	7623,	Greensburg.	33.34
7577,	Pittsburgh,	31.54	7624,	Greensburg,	23.48
7578,	Pittsburgh,	27.63	7625,	Greensburg.	30.88
7579,	Pittsburgh,	36.01	7626,	Greensburg,	31.51
7580,	Pittsburgh,	35.71	7627,	Greensburg,	32.76
7599,	Pittsburgh,	29.51	7615,	Johnstown,	35.65
7600,	Pittsburgh,	31.37	7616,	Johnstown.	30.17
7601,	Pittsburgh,	30.99	7617,	Johnstown.	25.76
7602,	Pittsburgh,	30.92	7618,	Johnstown,	32.14
7603,	Pittsburgh,	35.48	7619,	Johnstown,	36.28
7604,	Pittsburgh.	37.15	7557,	Sharon,	36.16
7605,	Pittshurgh,	29.68	7558,	Sharon,	35.09
7606,	Pittsburgh,	29.68	7559,	Sharon,	34.51
7629,	Pittsburgh,	30.83	7560,	Sharon,	37.36
7633,	Pittsburgh,	32.44	7645,	Meadville,	37.31
7634,	Pittsburgh,	36.17	7646,	Meadville,	36.82
7638,	Pittsburgh,	31.94	7647,	Meadville,	29.47
7561,	Washington,	32.46	7635,	New Castle.	35.42
7562,	Washington,	35.51	7636,	New Castle,	31.13
7363,	Washington,	29.24	7637,	New Castle,	29.67
7564,	Washington,	28.86	7621,	Latrobe,	36.38
7565,	Washington,	30.37	7622,	Latrobe,	30.93
7566,	Washington,	28.93	7623,	Latrobe,	35.38
7567,	Washington,	30.19	7613,	Beaver,	31.17
7568,	Washington,	31.79	7614,	Beaver,	30.29
7569,	Washington,	30.36	7609,	Beaver,	40.39
7570,	Washington,	37.14	7610,	Beaver,	32.04
7589,	Allegheny,	30.77	7607,	Rochester,	32.28
7590,	Allegheny,	32.68	7608,	Rochester,	33.81
7591,	Allegheny,	33.87	7630,	Irwin,	29.59
7592,	Allegheny,	32.78	7631,	Irwin,	33.79
7593,	Allegheny,	29.21	7630,	Irwin,	29.59
7594,	Allegheny,	36.29	7650,	Oil City,	34.50
7595,	Allegheny,	35.11	7651,	Oil City,	33.83
7596,	Allegheny,	33.59	7652,	Butler,	30.07
7597,	Allegheny,	33.87	7653,	Butler,	36.51
7598,	Allegheny,	35.88	7654,	Butler.	31.51
7581,	Braddock,	31.88	7612,	New Brighton.	37.93
7582,	Braddock,	31.29	7611,	New Brighton,	34.37
7583,	Braddock,	36.84	7648,	Franklin.	36.05
7584,	Braddock,	31.37	7649,	Franklin,	31.29
7585,	Braddock,	29.93	7628,	Jeannette,	32.94
7586,	Braddock,	31.48	7620,	Derry,	32.47
7587,	Braddock.	39.71			
7588,	Braddock,	33.6)			
7639,	Erie,	35.44		Average,	32.60

Analyses of Samples of Cheese by Dr. William Frear, from Samples Selected in the Interior of Pennsylvania.

Number of sample.	Place of Selection.	Per cent. of butter-fat.	Number of sample.	Place of Selection.	Per cent. of butter-fat.
1,	Lewisburg,	32.17	53,	Altoona,	38.70
2,	Lewisburg,	32.85	54,	Altoona,	36.90
3,	Lewisburg,	31.05	55,	Altoona,	37.85
4,	Lewisburg,	34.65	56,	Altoona,	33.53
5,	Lewisburg,	32.40	57,	Altoona,	35.55
6,	Sunbury,	33.30	58,	Altoona,	31.73
7,	Sunbury,	33.08	59,	Altoona,	35.78
8,	Sunbury,	34.20	60,	Altoona,	34.88
9,	Sunbury,	33.75	61,	Altoona,	36.68
10,	Sunbury,	31.95	62,	Altoona,	34.43
11,	Sunbury,	33.08	63,	Altoona,	38.25
12,	Sunbury,	32.40	64,	Altoona,	36.00
13,	Sunbury,	34.88	65,	Altoona,	29.25
14,	Sunbury,	30.83	66,	Bellefonte,	36.00
15,	Sunbury,	32.63	67,	Bellefonte,	34.20
16,	Williamsport,	36 45	68,	Bellefonte,	36.23
17,	Williamsport,	35.10	69,	Bellefonte,	37.80
18,	Williamsport,	34.43	70,	Bellefonte,	37.13
19,	Williamsport,	33.53	71,	Lemont,	39.60
20,	Williamsport,	33.75	72,	Lemont,	39.83
21,	Williamsport,	32.17	73,	State College,	37.35
22,	Williamsport,	31.95	74,	State College,	37.35
23,	Williamsport,	33.53	75,	State College,	34.88
24,	Williamsport,	31.50	76,	Wilkes-Barre,	36.00
25,	Williamsport,	35.78	77,	Wilkes-Barre,	39.38
26,	Williamsport,	34.65	78,	Wilkes-Barre,	38.25
27,	Williamsport,	33.75	79,	Ashley,	32.25
28,	Williamsport,	34.65	80,	Ashley,	33.08
29,	Williamsport,	34.88	81,	Wilkes-Barre,	36.23
30,	Williamsport,	31.95	82,	Kingston,	39.83
31,	Williamsport,	39.60	83,	Kingston,	36.68
32,	Williamsport,	35.55	84,	Kingston,	34.20
33,	Williamsport,	37.13	85,	Edwardsville,	38.25
34,	Williamsport,	34.65	86,	Wilkes-Barre,	36.00
35,	Williamsport,	35.10	87,	Wilkes-Barre,	37.80
36,	Williamsport,	34.65	88,	Wilkes-Barre,	40.95
37,	Williamsport,	33.53	89,	Wilkes-Barre,	36.00
38,	Williamsport,	32.85	90,	Wilkes-Barre,	37.58
39,	Williamsport,	37.13	91,	Wilkes-Barre,	36.90
40,	Williamsport,	35.55	92,	Wilkes-Barre,	34.65
41,	Tyrone,	34.20	93,	Wilkes-Barre,	37.58
42,	Tyrone,	35.51	95,	Wilkes-Barre,	34.43
43,	Tyrone,	34.20	96,	Wilkes-Barre,	34.65
44,	Tyrone,	29.93	97,	Wilkes-Barre,	36.23
45,	Tyrone,	35.10	98,	Wilkes-Barre,	36.23
46,	Altoona,	37.25	99,	Wilkes-Barre,	38.70
47,	Altoona,	36.45	100,	Wilkes-Barre,	38.70
48,	Altoona,	36.23			
49,	Altoona,	31.95			
50,	Altoona,	40.05			
51,	Altoona,	33.75			
52,	Altoona,	39.83		Average,	35.30

Analyses of Samples of Cheese by Prof. C. B. Cochran, Selected in the Eastern part of Pennsylvania.

Number of sample.	Place of Selection.	Per cent. of butter-fat.	Number of sample.	Place of Selection.	Per cent. of butter-fat.
1,	West Chester,	31.71	79,	Philadelphia,	34.85
2,	West Chester,	35.87	80,	Philadelphia,	32.42
3,	West Chester,	34.11	81,	Philadelphia,	34.14
4,	West Chester,	41.53	82,	Philadelphia,	31.15
5,	West Chester,	39.73	83,	Philadelphia,	31.36
6,	West Chester,	36.80	84,	Philadelphia,	35.51
7,	West Chester,	36.05	85,	Philadelphia,	29.28
8,	West Chester,	33.69	86,	Philadelphia,	29.35
9,	Philadelphia,	34.61	87,	Philadelphia,	33.90
10,	Philadelphia,	36.40	88,	Philadelphia,	33.46
11,	Philadelphia,	33.51	89,	Philadelphia,	33.90
12,	Philadelphia,	33.89	90,	Philadelphia,	32.65
13,	Philadelphia,	34.70	91,	Philadelphia,	34.86
14,	Philadelphia,	36.09	92,	Philadelphia,	23.92
15,	Philadelphia,	35.87	93,	Philadelphia,	28.39
16,	Philadelphia,	33.39	94,	Philadelphia,	28.39
17,	Philadelphia,	33.64	95,	Philadelphia,	32.68
18,	Philadelphia,	32.33	96,	Philadelphia,	34.74
19,	Philadelphia,	32.81	97,	Philadelphia,	32.90
20,	Philadelphia,	32.45	98,	West Chester,	32.84
21,	Philadelphia,	34.57	99,	West Chester,	33.33
22,	Philadelphia,	33.16	100,	West Chester,	33.80
23,	Philadelphia,	34.43	59,	Coatesville,	33.30
24,	Philadelphia,	33.20	60,	Coatesville,	33.90
25,	Philadelphia,	30.20	61,	Coatesville,	35.61
26,	Philadelphia,	32.14	62,	Coatesville,	34.35
27,	Philadelphia,	35.05	63,	Coatesville,	33.72
28,	Philadelphia,	33.94	64,	Coatesville,	32.65
29,	Philadelphia,	32.88	65,	Coatesville,	36.30
30,	Philadelphia,	36.19	66,	Coatesville,	34.30
31,	Philadelphia,	35.50	67,	Coatesville,	23.04
32,	Philadelphia,	35.56	68,	Coatesville,	33.48
33,	Philadelphia,	31.61	69,	Coatesville,	36.21
34,	Philadelphia,	34.39	56,	Downingtown,	34.15
35,	Philadelphia,	32.81	57,	Downingtown,	32.04
36,	Philadelphia,	34.74	58,	Downingtown,	38.76
37,	Philadelphia,	39.42	70,	Downingtown,	33.06
38,	Philadelphia,	32.50	71,	Downingtown,	32.02
39,	Philadelphia,	32.06	72,	Downingtown,	31.20
40,	Philadelphia,	33.12	73,	Downingtown,	35.80
41,	Philadelphia,	34.52	74,	Downingtown,	34.12
42,	Philadelphia,	32.14	101,	Harrisburg,	36.81
43,	Philadelphia,	29.00	102,	Harrisburg,	34.21
44,	Philadelphia,	35.03	103,	Harrisburg,	34.35
45,	Philadelphia,	34.70	104,	Harrisburg,	35.61
46,	Philadelphia,	37.20	105,	Harrisburg,	35.29
47,	Philadelphia,	31.35	106,	Harrisburg,	34.04
48,	Philadelphia,	36.13	107,	Harrisburg,	35.00
49,	Philadelphia,	30.48	108,	Harrisburg,	36.16
50,	Philadelphia,	36.30	109,	Harrisburg,	33.41
51,	Philadelphia,	34.87	110,	Harrisburg,	32.94
52,	Philadelphia,	28.74	111,	Harrisburg,	28.63
53,	Philadelphia,	34.90	112,	Harrisburg,	34.77
54,	Philadelphia,	33.07	113,	Harrisburg,	28.06
55,	Philadelphia,	33.90	114,	Harrisburg,	33.93
75,	Philadelphia,	35.05	115,	Harrisburg,	32.55
76,	Philadelphia,	33.80			
77,	Philadelphia,	31.50			
78,	Philadelphia,	32.88		Average,	33.60

In order to fairly test the claim that samples taken from different portions of the same cheese would show sufficient variation to convict or discharge an offender against the law, Profs. Aschman, Frear and Cochran were directed to conduct three entirely independent series of analyses, from samples selected under their own supervision.

Prof. Aschman obtained a series of samples as follows: "The samples were taken from a slice of the cheese cut entirely across the cheese, and are marked, beginning on one side and in regular sequence." The rind was discarded as likely to improperly influence the result. Prof. Aschman's reports of this test are as follows:

Sample A,	33.61
Sample B,	32.96
Sample C,	32.65
Sample D,	33.17
Sample E,	32.75
Sample F,	32.63
Sample G,	32.62

The maximum result is 33.61; the minimum result is 32.62; the average result is 32.92; the variation between the maximum and minimum results is 0.99; the variation between the maximum and average results is 0.66; the difference between the minimum and average results is 0.29. An analyses of the thin slices discarded as the "rind," showed 40.34 of butter-fat, indicating that the rind had absorbed some of the oily material with which the cheese had been rubbed.

Another test made by Prof. Aschman, from samples taken in a similar manner, but from another cheese, gave the following results:

Sample A,	35.29
Sample B,	34.16
Sample C,	34.66
Sample D,	34.74
Sample E,	35.23

The average of the above samples indicates 34.81 of butter-fat, and Prof. Aschman found that a sample formed by mixing them all together gave 34.72 actual test.

A third test, by the same chemist, from a sample from another cheese, the slice being taken in a line across the cheese and the individual samples by cross sections, gave the following results:

Sample A,	36.11
Sample B,	35.67
Sample C,	35.76
Sample D,	35.98

The first test by Dr. Frear was made from samples selected as follows:

"The samples were selected so that no portion of their surface, except the rind, had been exposed to the air. The samples were cut so as to separate the rind at the outer edge and to divide the remainder

of the slice into three vertical sections. All of these sections were then equally sub-divided into upper and lower portions. The rind was in each case about an inch in thickness."

The results of these two tests made in this way were:

Sample A.	Inner Section.	Middle Section.	Outer Section.	Rind.
Upper half, ...	35.55	36.45	37.13	40.05
Lower half, ...	36.90	36.00	36.90	40.27

Sample B.	Inner Section.	Middle Section.	Outer Section.	Rind.
Upper half, ...	36.45	36.45	36.45	42.32
Lower half, ...	36.90	36.45	36.45	41.40

In a test made by Prof. Cochran, a sample was taken from the outer surface to the centre of a large cheese. The rind was discarded and the section divided into four samples at right angles to its position in the cheese. The results were as follows:

Sample A, ...	34.65
Sample B, ...	33.76
Sample C, ...	33.54
Sample D, ...	33.96

Another test by the same chemist, but from another cheese, gave as results:

Sample A, ...	33.75
Sample B, ...	33.94
Sample C, ...	32.88
Sample D, ...	33.37

A third test by the same chemist, but from another cheese, gave:

Sample A, ...	34.20
Sample B, ...	33.85
Sample C, ...	33.42
Sample D, ...	33.21

In order to have a fair and impartial test of the question of the variation of different days make of cheese under practically the same condition, Hon. J. B. Phelps, of Conneautville, Crawford county, Pa., was requested to take samples from any ten days consecutive production of his factory and forward them to Prof. F. T. Aschman, of Pitts-

burgh; the analyses were carefully made by Prof. Aschman and show the following percentage of butter-fat:

July 21,	41.77
July 22,	42.36
July 23,	42.67
July 24,	39.89
July 25,	41.77
July 26,	40.38
July 27,	43.31
July 28,	42.25
July 29,	39.79
July 30,	42.27

In this test the maximum amount of butter-fat was 43.31, the minimum amount was 39.89, and the average was 41.65; the variation between the maximum and the average was 1.66; the variation between the minimum and the average was 1.77; the variation between the maximum and minimum was 3.42.

It will be remembered that in this case Mr. Phelps was certain that he had a "full cream cheese" and in this connection the high percentages of butter-fat are a conclusive answer to the claim that the legal standard of 32 per cent. is not attainable; it should also be remembered that the samples were from "comparatively green" cheese, the last one having been made July 30, and the analyses made September 3, of the same year.

The results of the investigations made as above, enabled the Department to come to the following conclusions:

1. That the law does and cannot require impossibilities, and that therefore in the case of imported (foreign) cheese, the name and address of the importer or wholesale dealer will, as nearly as is practicable, fulfill the requirements of the law.

2. That the standard of 32 per cent. of butter-fat for a "full cream cheese" is not too high and is readily attainable by any careful and practical manufacturer, and that it is in favor of, rather than against the manufacturer.

3. That the slight variation in the amount of butter-fat in different portions of the same cheese, the rind being discarded, are not of sufficient amount to influence results, and that even this slight variation may be avoided by taking the samples with a cheese "trier" which ensures a fair section of the cheese.

4. That, under proper management, the variation caused by the milk of different days is not of sufficient importance to modify results, especially as it is not the intention of the Department to prosecute upon close or small margins.

5. The law does not state that the cheese must be branded upon the

band; the words of the act are "shall be branded or stenciled in ordinary bold faced capital letters, not less than one inch in height, on two sides of the cheese, and upon the top and bottom of the box or case containing the cheese;" the top and bottom are "two sides of" of the cheese and if properly branded or stenciled there, will sufficiently comply with the law; the objection that the brand may be removed with the portion of the cheese first sold, may be obviated by making it a rule to leave at least a portion of the brand upon the last piece.

The question of the percentage of butter-fat in imported (foreign) and fancy cheese having been raised, Prof. Aschman was directed to procure samples of this class of cheese and make a series of analyses; the results of this test are as follows:

No. 7655. Neufchatel Cheese, Domestic make, 20 cents per pound, 26.36.

No. 7656. Imported Limburger, 30 cents per pound, 33.81.

No. 7702. Framage de Isigny, American, 50 cents per pound, 21.62.

No. 7703. Parmisan Cheese, Italian, 40 cents per pound, 32.09.

No. 7704. Fromage de Roquefort, Imported, 35 cents per pound, 25.98.

No. 7705. Creme de Brie, French, 70 cents per pound, 25.15.

No. 7706. English Dairy Cheese, Imported, 25 cents per pound, 34.76.

No. 7707. Fromajo Romano, Italian, 30 cents per pound, 34.31.

No. 7708. Cachocavalla Cheese, Italian, 25 cents per pound, 27.31.

No. 7709. Fromage De Chemembert, French, 70 cents per pound, 25.29.

REPORT OF THE DEPUTY SECRETARY AND DIRECTOR OF FARMERS' INSTITUTES.

Harrisburg, January 1, 1898.

Hon. Thomas J. Edge, Secretary of Agriculture :

Dear Sir: The work of the Division of Farmers' Institutes for the past year has been quite satisfactory. As has been explained in a former report, the institute season does not correspond with the calendar year, but extends from the 1st of May to the 30th day of the following April. The necessity for this method of reporting is due to the fact that the institutes are held in the winter season, and a report made from January to December 31, would not give the operations of the institute year, and consequently would be incomplete.

The experience of the previous year, in which the institutes began in October, and continued until the middle of the following April, made it clear that the period in which institutes could be held with the greatest convenience and advantage to the farmers of the State, would have to be considerably shortened. The farm work in the late autumn, and the bad roads of the early spring often prevented many from coming to the institutes who would have been glad to have availed themselves of the opportunity, if these conditions had not interfered. Accordingly, the first meetings for the season of 1895-6, were set for November 4, and the last one for the 19th of March.

In order that it might be possible to hold the number of meetings arranged for in the time specified, it became necessary to divide the State into three districts, and appoint institute lecturers for each district. Three lecturers were in each division, one regular speaker who represented the Department of Agriculture, one scientific expert supplied by the State Experiment Station, and the third member who was a specialist in some line of agricultural practice. The third member of the force was changed from time to time, in order to have the advantage of fresh topics, and also to give opportunity for training some new men in the institute work. Quite a large percentage of these third men failed to appear, to the great inconvenience and disappointment of the managers. An effort will be made to remedy this in the future by securing a positive promise from each man who proposes to go on the force, that he will meet his engagements.

Eighty-two lecturers were on the list, constituting an array of talent not excelled by that of any other state in the Union. There were in all three hundred and eighty days of institute held during the season,

as against two hundred and sixty-four days the previous year, making a total for the two years of five hundred and seventy-two days, at a cost to the State of $15,000, which was the appropriation for institute work. This sum does not include the salary of the Director of Institutes or his travelling expenses. The expeuse per day, therefore, was about $26.00. Of the entire sum, $6,891.93 was handed over to the local managers in the several counties for local uses, and $8,108.07 went to the payment of State speakers, including their travelling expenses, hotel bills and salaries, making $12.00 expended by the local manager, and $14.00 expended by the Director of Institutes in supplying lecturers and meeting their expenses. About fifty thousand people were reached during the season. The total number of institutes was one hundred and eighty-eight, and the average attendance was about two hundred and fifty. Of the one hundred and eighty-eight institutes held, sixty-five were one day institutes and one hundred and twenty-three were two days.

The apportionment of time to each county is made on the basis of two days of institute to every county having not over one thousand farms; three days to each county having more than one thousand and not over fifteen hundred; afterwards, one day for each fifteen hundred farms or fraction thereof additional. This insures Department aid to each county in proportion to its agricultural interests.

The allotment of money last year was $9.00 per day for local expenses, not including the expenses of the meeting of the local managers on the second Tuesday of June. The State furnished also in every case two lecturers free of expense to the locality, and in many instances three. A large number of posters were distributed to the various county managers for use in advertising, also postal cards upon which an invitation to the institutes was printed, all ready to address to farmers and others interested in agricultural affairs. Many thousand circular letters to prominent farmers were also sent out directly from the Department, calling attention to the institutes to be held in their locality and urging them to attend and take part in the exercises. A letter was also addressed to each county superintendent of public schools asking them to invite the school teachers, school directors, and through them the school children, to the educational session. To this request there was a very cordial and general response, and we were favored with the presence and assistance of the prominent educators of each county, at many of the sessions. The school children also turned out, and were among our most interested and appreciative listeners.

In planning the work for that year the following circular letter was sent out by the Director to all of the local managers, with the request that they comply with the suggestions which it contains.

"In order that the work may be most effective, our efforts should be concentrated upon a few fundamental objects, rather than be scat-

tered over a large area, thus wasting power and accomplishing comparatively little. Much institute work in this and other states has failed to effect the best results, not because the workers were not competent, conscientious and energetic, but because those directing their efforts did not have before them, a well defined and definite set of objects to be attained. It is proposed to attempt to correct this error into which we and others have fallen, by prescribing three topics which are to be discussed in every institute to be held in Pennsylvania this season.

"In every two days' institute the evening session of the first day is to be set apart for the benefit of ladies, and is to be in the interest of 'Country Homes.' This will include all that relates to home life in the country. The constructing of homes, the heating, lighting, ventilating and sanitary arrangements for country homes; the water supply, sewage and plumbing for houses in the country; the cooking of foods, the care of the sick, the care of children, flower gardening, kitchen gardening, house decoration and all that relates, in any way, to comfort, convenience, health and enjoyment in a country home. As many ladies as possible should be put on the programme for this session.

"The afternoon session of the second day is to be devoted to the subject of 'Good Roads.' This is a 'Supervisor's Session,' and as far as may be necessary, all discussions are to be upon the subject of roads and their improvement. The evening session of the second day is to be an 'Educational Session,' and is to be distinctively in the interest of the education of the farmer and his children, and all that concerns their intellectual nature and development. Under this topic can be discussed the course of reading for farmers, the institute, the grange, the alliance and the farmers' club as educators. Also the country district school, the country high school, courses of study for country children, etc. To this all school teachers and school children ought to be invited; also school directors, county superintendents and all who are interested in the education of country people. In the two sessions, institute managers have the option of introducing such topics relating to agriculture as they deem best, but the three sessions, named are prescribed, and no option is given with regard to them. This is done that we may, in all of our institutes, concentrate all of our energies, for at least one season, upon the solution of these most important questions that now interest us as farmers, and affect so deeply the present and future well being and proseperity of ourselves and our children. Another season we can take up some other topics and discuss them thoroughly, and thus get at the best thought of our farmers upon matters vital to agricultural people. Every two day programme, therefore, will contain these three topics, and have them scheduled at the time of day just designated.

"Every one day institute will have the afternoon session devoted to 'Good Roads,' and the evening session to 'Education for Farmers and their Children.' The morning session is left open for the more general topics relating to agriculture. Let us all unite in a determined effort to make these discussions of the greatest value to the interests represented, and thus come to a more perfect understanding, as to what is best to be done, in regard to these serious social questions which confront us. In selecting speakers, therefore, keep in mind the topics prescribed, and secure persons who will be able to give information that will aid us all to a better understanding of the subjects discussed, and form the basis for making up a judgment upon which to act."

The State lecturers were also written to, and requested to prepare themselves for the discussion of the topics prescribed. The effect of this concentration of thought upon these special subjects was very far reaching, and no doubt did much in the way of securing to the State a uniform method of road supervision and control, together with the promise of State aid in road construction, and also awakened a lively interest in the public schools, and materially assisted in preserving intact the State appropriation of $5,500,000 for school purposes, and also did much to open the eyes of country people to the great inequality in the distribution of this fund, and aided in enacting the present law which provides for a more equitable method.

Great interest was also awakened in the improvement of country homes, and in lightening the burdens of those who occupy these homes. The ladies have taken an active and intelligent part in these sessions, and in many cases the meetings were conducted entirely by the ladies. The experiment was therefore quite successful, and in my opinion ought to be continued.

The great weakness of our country people lies in their lack of consolidation of thought upon a given question. When all of the country people agree upon any given subject their desire will be gratified. Their failure lies in their lack of agreement, and the lack of agreement is usually due to a lack of accurate knowledge of the subject and its true bearing upon their industry. A campaign of education is therefore a necessity premilinary to action upon any great public question, and the education ought to be given by disinterested and fair minded teachers, who have made special study of the problems. and are prepared to explain their workings in a clear and practical way, and outside of partisan lines. The institute does this, and by having some leading topics prescribed for every institute held in the State and the time fixed at which a given discussion is to occur, the Department is enabled to advertise these meeting weeks in advance, and secure the interest and attendance of a large number of people who would otherwise have had no knowledge of the intended discussion.

The local managers of the institutes have for the most part been very cordial and efficient in the work. The chairmen of these boards are men of long experience as members of the State Board of Agriculture, and can be relied upon to do all that is possible to make their institutes a success. I wish again to express my appreciation of their hearty and efficient support and faithful work. Too much praise cannot be given them for their long continued service, and for the spirit and enthusiam that they manifested in forwarding this, the greatest educational movement of our time. The local boards of managers have also been earnest and efficient and have cheerfully aided in organizing and carrying on the institutes in their immediate localities. After speakers have been selected, places and dates chosen and all of the preliminary work done, the institute will still be a failure if the local committee do not advertise it and work up an interest in its success. A live, active grange, alliance or farmers' club will insure a successful institute, if one is held in their locality, and much of the success is due to the active and intelligent co-operation of these various organizations. Sometimes local jealousies between different societies have interfered with the best results, but as a rule these, are, for the time, laid aside, and all have united in a harmonous meeting and have made it a success.

Our lecturers also have shown good judgment and marked ability in the work in which they have engaged. Most of them are men and women of exceptional ability, and are specially qualified to give instruction. It is a rare thing for them to fail in creating a good impression in their presentation of the facts that they are trying to impress. Reports are required from these lecturers, and also from the local managers so that glaring errors cannot occur without the matter being noted and information forwarded to the Department. These communications are, of course, confidential, and are solely for the guidance of the director of institutes in the prosecution of the work. Lecturers and managers are therefore requested to use perfect freedom in reporting the defects of preparation or other important matters affecting the efficiency of the institutes, and know that their communications will be treated in a confidential way and with proper respect. They are also specially urged to report all efficient work and offer suggestions for still greater improvement. Local managers and essayists are specially to be encouraged, and every effort be put forth to bring out home talent, being careful to have it work along agricultural lines. The purpose is to develop agriculture, and this is most effectively done by developing the individual. It is impossible to publish all of the papers and essays that are presented, owing to lack of space, accordingly, only some of the best are selected and printed in the annual report.

Public sentiment is now, more than ever, demanding institutes for instruction. Their great value is being more widely appreciated, and

much embarrassment is now experienced, in selecting, from the many applications for institutes, the few places that it is possible to supply. The Legislature at its last session showed the increasing favor of this work, in the estimation of our farming people, by appropriating $12,500 per year for the next two years, an increase of $5,000 per year over the previous appropriation. It is very gratifying to have this appreciation shown in such a substantial way, and it is hoped that the future work will abundantly justify the liberality thus shown.

The farmers' institute movement has been developing very rapidly in the last few years, until now it is in existence and operation in some form in nearly every state in the Union, as well as in the Provinces of Canada. The uniform testimony is that it meets an immediate need on the part of our agricultural people in taking to them the latest scientific explanation of the best methods in agriculture, as demonstrated by actual practice, by the experiment stations, and upon individual farms. Farmers find that they can learn more satisfactorily about their business, from oral teaching and through conversation with specialists upon agricultural topics, than from any other source of information. The institute provides this method of instruction, and is getting down closer each year to the actual needs of agriculture and is therefore interesting and benefitting a larger number than ever before. The chief difficulty in most localities is to secure halls large enough to hold comfortably the people who attend.

A National organization of institute managers was effected in March, 1896, and at a subsequent meeting held October 14, of the same year in Chicago, a constitution and by-laws were formally adopted, and the organization named "The American Association of Farmers' Institute Managers." A third meeting was held in Columbus, Ohio, and whilst comparison of institute work, as conducted in the several states, showed diversity of operation, yet the leading purposes were found to be identical, namely, to carry instruction in agriculture to farmers of the country, and to assist rural people by giving opportunity for interchange of views as to the most successful practice under the conditions that exist in the several communities throughout the land. In all of the states except one or two, the same general system of management prevails; a State institute manager who has general direction of the work, also local committees who look after the details in localities where the institutes are to be held. As I have intimated, in matters of detail there was great diversity, but the leading objects were the same, namely, that the farmers' institute is an educational institution, and ought to be conducted with that idea as the controlling feature in the work. The writer was asked to prepare a paper for the National meeting at Columbus, Ohio, upon "How May the Distinctively Educational Value of Institutes be Promoted." As this is a vital question in this State, and one that needs immediate solution, a portion of that paper is incorporated in this report as giving a possible way out of the difficulty that confronts us.

Whatever the original conception of the farmers' institute was, it is now perfectly clear that it ought to be a school. Not a school for general culture, but a school for the teaching of the principles of practical agriculture. The value of any school is due to two things. First: The facts or information that it gives to the scholars. Second: The awakening or vivifying power that it imparts, which induces or compels the scholar to think.

The farmers' institute is no exception to this rule. It ought to impart valuable information in regard to the farmer's calling in all of its details, and should also be a sort of a revival meeting, stirring up the sluggish or disheartened farmer to new ideas, showing him the possibilities of agriculture when properly pursued, and encouraging and stimulating those who are engaged in it to renewed exertion and to the more intelligent use of the means necessary to success in this occupation.

The amount of time that ought to be allotted in an institute to the information giving work, and the amount to that of revival and the entertainment, depends upon the character of the audience and their previous history and training. If the people live in an old, settled, highly educated and advanced community, the educational or information side ought to predominate and often, perhaps, occupy all of the time. If, on the other hand, the community is new and agriculture backward, the people not so far advanced and the location remote, a more elementary course of instruction must be provided, and a considerable proportion of the time be given to entertainment and encouragement. In other words, a sort of kindergarten method be pursued until the people are prepared for the more strictly educational work. It is the experience of institute workers in about all of the states that the methods and instruction that were suitable ten years ago in the institute work, are no longer satisfactory, but a higher grade of teaching is demanded.

In discussing the information giving side of the institute work, we are met, at the outset, with the question: What ought the institute to teach, and what ought to be the standard of its educational work?

Heretofore, in most of the States, the question of what the institutes shall teach has been left to the various localities to select. As a consequence, there has been no systematic or prescribed course of instruction, but a desultory and fragmentary method somewhat on the restaurant plan of, "order what you wish," and we will try to supply you. So long as the institute work is in the revival stage of its progress, this method, is, perhaps, the only one that can be pursued, but when it reaches the true educational idea, then a more systematic and logical method of education will be a necessity.

Such an ideal cannot, of course, be introduced suddenly, or ever, perhaps, be entirely substituted for the present method, but it is possible, and, in my opinion, will soon become imperative, to gradually

prescribe some topics to be taken up all over the State in every institute that is held, selecting such subjects as are of vital importance.

The abandonment of the haphazard method of instruction and the gradual adoption of a carefully planned and systematic course of study will mark a new and most important era in institute development. What the institute shall teach ought to be limited to the study of subjects bearing directly upon the life and occupation of agricultural people. It is, of course, impossible to take up, in any proper sense, the study of botany, geology, chemistry and kindred subjects. First of all, there is not the time for such a course, and the institute student, as a rule, is beyond the period of life when he can undertake such work as this. The most that can be done is to teach the institute scholar the results of scientific research. To show the application of science and the arts to his industry and acquaint him with the methods by which favorable results are most surely and economically reached. Wherever the farmer has had the advantage of scientific training, his understanding and appreciation of the truths taught will be greatly increased and his ability to use the knowledge conveyed will be greatly enlarged.

But the other question now arises, how far shall such teaching be carried? In other words, what is the limit beyond which it cannot go?

There is no limit beyond which such information may not go. The most thorough, the most scientific, if it be made practical, will be the best, and whenever great underlying principles can be presented, the more valuable and generally useful will the instruction be. Agriculture has abandoned swaddling clothes and the diluted diet of years ago. She is now demanding strong meat, and her future growth and development will be in proportion, as she receives the nourishment that her enlarged life and increased activities require.

She is rapidly leaving superstitious and empirical methods, and is being guided by the exact and reliable revelations of science, and is engaged in making her calling more pleasant as well as more profitable and her rewards sure. The time for guessing is fast disappearing and the day of definite knowledge is at hand. Not long ago men did not know, because they could not know. But now, thanks to modern science and discovery, knowledge has increased and the farmer of to-day can not excuse his ignorance and failure, on the plea that the true principles of procedure are unrevealed. The danger is not that too much knowledge may be given, provided the truth to be imparted be suitably prepared and agreeably and forcibly presented.

The serious problem now is, how shall this knowledge that exists, and which is to aid the rural people in their occupation, best be disseminated, so that those who need it shall receive it in its most useable form?

The farmers' institute has undertaken to do this by means of oral

teaching. By bringing competent men and women before assemblies of agricultural people, and there, face to face, presenting the truths that their study and experience have shown to be adapted to the needs of farmers and to be of practical value in their calling. In the earlier stages of the institute work there was comparatively little difficulty in securing a sufficient number of capable persons for this service. But now, as the requirements of the people have become more exacting, and the standard of teaching more advanced, the greatest difficulty that the institute director meets is to find teachers who are competent to properly and profitably instruct those who are seeking knowledge. This difficulty has increased within the last few years, until now it is a serious question to know where suitable lecturers can be found. As the work advances this difficulty will continue to increase, and unless some means are found for supplying this increasing demand, we will soon be unable to carry on the work as its importance and character require.

A school pre-supposes teachers. The better the teacher the better the school, and no educational institution can rise above the level of its instructors. If, therefore, the educational value of our institute work is to be increased, we must secure the services of high grade instructors, and cease to employ those who are incompetent or inapt to teach.

How are such men to be secured? Men and women competent for this service are not unemployed. Their qualifications have made them valuable, and such people are in demand at remunerative salaries in the various industries and educational institutions of the country.

If institute directors wish their services, they can only secure them during a vacation period, or by special contract made subject to the possibilties of being called away by the regular duties of their occupation. Comparatively few have made institute work a profession and very few will do so unless the conditions that now prevail are materially changed.

Under our present system, the institute lecture season continues for about three or four months in every year, and the men who are engaged as lecturers have no assurance of any employment after the institute season has expired. Very few are situated so as to drop their present work and take up the lecture course for the limited period through which it lasts.

As I have stated, the demand for high grade instruction is becoming greater each year, and yet no man can afford to devote himself to special preparation for this work for the short period for which his services are, at present, required. We are in the position of having an ever increasing demand, and a stationary or perhaps diminishing supply; a situation fatal to further progress.

The overcoming of this difficulty may necessitate an entire change in our methods of conducting institute work. We will be under the

necessity of giving employment to our best men the entire year, so as to make institute teaching a distinct profession, and thus make it worth the time and effort necessary for competent men and women to prepare themselves for it and make it a life pursuit.

Can this be done, and if it is possible, what is the plan, and are we ready to undertake to carry it into effect?

Let the institute director sub-divide the State into institute districts, each composed of several counties, and appoint one or more lecturers to have charge of each district. Let these districts be again sub-divided into comparatively small divisions, either township or school districts as may be thought best, and establish a school in each of these sub-districts whose members would meet at least once each month to hear a lecture on some general agricultural topic, the lecturer being the teacher who had been appointed over the larger district, and whose duty it should be to visit each school once each month to deliver a lecture and to advise in regard to any other matters relating to agriculture that might be of interest to the locality. They should also, when opportunity offers, hold meetings in the fields, orchards, gardens and barns of the farmers, and there, in an informal and practical way, call attention to new, improved, and more economical methods; point out defects in practice, suggest remedies, and thus, in the presence of the conditions as they actually exist in that community, assist the farmers in meeting and surmounting their difficulties.

Let this system continue for about eight or nine months of the year, from spring until winter, and, when winter comes, advertise for an institute for each county to last for one week, at which the whole corps of lecturers should be present, taking turns as instructors and exchanging as soon as one instructor has finished with another who will take up a different topic. Several institutes could be in operation at the same time in different counties, thus keeping the entire force engaged, the entire programme to be previously arranged so as to comprise a thorough and systematic course of instruction for the entire State. The lecturer in charge of a district ought to first visit all localities where schools are proposed to be located and secure the names and consent of a number of farmers agreeing to attend at the places, and on the dates fixed for its meetings, and to supply a suitable building in which to meet, and see that it is in proper condition for use.

Such a lecturer could be provided with suitable apparatus for illustration, and when he has finished the course of lectures prescribed, he would be replaced by another teacher with a different set of subjects.

Such a system would have several advantages. It would furnish occupation during the entire year for the institute force and, consequently, would attract our best men to this service.

It would provide systematic instruction to our farming people, a necessity in every course of instruction that is to be of value and is to continue.

It would awaken an interest in agriculture in every community, and contribute to the success of the general county institute held in the winter.

It would disseminate information of the most valuable kind and be an opportunity for interesting the young country people in agriculture, and be a means of influencing them to take advantage of the higher institutions of learning established to fit young people for agricultural pursuits.

It would prove an efficient agent for the establishment of reading circles among our farmers, and bring to their attention the latest and best literature upon the subjects related to their calling.

It would transform the farmers' institute into a complete and well-equipped educational institution for the education of the farmers, and bring to their doors the latest and best methods of agricultural practice known.

The value of the agricultural institute is dependent upon the efficiency of the teachers employed to give instruction, and the future progress of the institute work will, therefore, be in exact proportion as these teachers increase in knowledge of the scientific and practical facts upon which successful agriculture is founded.

The important problem, therefore, for the future institute director to solve is to discover such a plan as will insure a sufficient number of competent teachers who will be willing to engage in this work, and be at hand for service whenever and wherever their presence is required.

Respectfully,

JOHN HAMILTON,

Deputy Secretary and Director of Institutes.

REPORT OF THE STATE ZOOLOGIST.

HARRISBURG, PA., January 1, 1898.

HON. THOMAS J. EDGE, SECRETARY OF AGRICULTURE:

Dear Sir: I have the honor to submit herewith the following report of work done during the present year, together with a brief abstract of work outlined for 1898. I have also included a short resume of miscellaneous papers on a number of zoological topics, several of which are or will be ready for the annual report of the Department.

These miscellaneous papers relate to subjects which are of especial interest to the citizens of this Commonwealth. Containing, as some do, a large amount of matter the result of careful field observations, they will, it is believed, be of especial interest and profit to those who are engaged in agricultural pursuits. If, in your judgment, these miscellaneous papers and special reports will exceed the space assigned in your annual report for the fiscal year, I would respectfully suggest that they be printed in bulletin form at as early a date as may be practicable.

The residents of this Commonwealth can obtain from the division over which I have the honor to preside, much useful information, if the matter now prepared or nearing completion is printed in an attractive form and given wide circulation, such as it should have.

These several miscellaneous papers, together with others in course of preparation, embracing a large number of subjects, are discussed in a popular way, and they will be acceptable, it is believed, alike to farmers, horticulturists, poulterers, natural history students and sportsmen.

The work of the division has, it is needless to say, been seriously hampered by the disastrous fire of February last, which consumed my private library of several hundred volumes, with note books containing data collected in my field work during the past twenty years. I also lost in the fire several thousand replies, which had been kindly sent by farmers, fruit growers and naturalists in Pennsylvania for the use of your Department, to circulars in relation to birds, insects and mammals. The loss of this valuable material is one which is almost irreparable. I have made several visits to Washington, D. C., and through the kindness of the heads of the several divisions of the agricultural and other departments have been enabled to replace a number of the scientific books, reports, bulletins and papers which were devoured by the flames. I have also spent considerable time at the

Smithsonian Institution and National Museum, Washington, D. C., the Philadelphia Academy of Natural Sciences and the Philadelphia Wagner Free Institute of Sciences, obtaining necessary data for the work of this division. This interruption in the work of my branch of your Department has prevented me from engaging in certain lines of active field work which had been determined upon last year when my annual report was submitted to you.

Early in January, last, I was detailed by you, at the suggestion of His Excellency, Governor D. H. Hastings, to assist the members of the Board of Game Commissioners in their work. In consequence of radical changes made in the game laws by the last Legislature, a very widespread interest has developed in all parts of the Commonwealth concerning the said laws, and a very universal interest is manifested by all classes of our State's citizens as to the importance and necessity of giving better protection to game, (birds and mammals).

To date I have answered fully two thousand letters on matters relative to game laws, game protection and other business of the Board of Game Commissioners. Several thousand postal cards and circulars giving information which the people wanted concerning laws relating to game, fish and wild birds and other matters, have been issued and distributed from this office.

I have sent to subordinate granges, Farmers' Alliance clubs, sportsmen's associations and individual farmers whose names were sent to this office by members of the Senate and House of Representatives, seven or eight thousand circulars making inquiries concerning game, fish and the economic relations of a number of our common birds and mammals, about which so many wrong impressions appear to exist in the popular mind. A vast amount of particularly valuable material has been received in reply to these circulars, and much of this matter will soon be available for publication in such form as you may deem proper to direct.

During the year drawing to a close, 357 specimens (39 species) of insect life have been received from farmers and horticulturists throughout the State. All have been identified and brief descriptions, with, in many cases, remedies for their destruction, have been mailed to persons who desired such information; 78 specimens (45 species) of birds—chiefly sparrows and warblers—have been received and identified. The common and technical names of these birds were returned, with short accounts of their food habits, to the farmers, sportsmen and ornithological students who requested such explanations. Eight specimens of mammals also reached this office and, as with the birds and insects, the desired information relating to the same was promptly returned to the senders.

Last year, when my preliminary report was sent to you, I had in manuscript eight or nine bulletins relating to different topics of especial interest to farmers, pomologists, naturalists and sportsmen,

ready for publication. With two or three exceptions these papers which had been prepared with much labor, both in field and office, and at considerable money expense, were totally or partly destroyed in the fire previously referred to. I have, however, had time to rewrite most of this matter, and will, at an early date, be able to give them to the public in bulletin form. Fortunately, one of the most valuable reports of this series, a paper, entitled "The Economic Status of the Mole Family in Pennsylvania," by Mr. Harry Wilson, an able and bright young naturalist of Chester county, was preserved in its entirety. This special report, prepared at your instance by Mr. Wilson, under the direction of the head of the Division of Zoology, is a most exhaustive and valuable one, and as it deals with a subject of especial interest to the agriculturist, it should not fail to meet with a cordial reception from farmers, many of whom are unjustly prejudiced against the moles, which are so often mistaken for field mice.

Assisted, as I have been most generously, by my good-hearted and brilliant colleague, Dr. J. T. Rothrock, Forestry Commissioner, I have, during the past few months, collected from numerous lumbermen and other sources a large amount of particularly interesting and valuable data, showing the character and extent of losses to many species of wild birds and mammals through devastating forest fires. This important and instructive matter will, with your permission, be prepared and published with other papers as a joint bulletin or special report by Dr. Rothrock and myself.

After a great deal of trouble I have collected (thanks to a good act of Assembly prepared by our Forestry Commissioner) "bounty and scalp" statistics from nearly all the counties of the State. These records, when published, will show clearly the folly of such wasteful and unwise legislation which leads frequently to the killing of many of the most valuable feathered and furred friends which the tiller of the soil has, and which devour the insect pests that attack his crops by night and day.

For several years past the writer has labored untiringly to prevent the passage of unjust scalp acts. By our united efforts, with the valuable assistance given by a number of the members of the State Board of Agriculture, we were enabled to bring about, after a very spirited contest, the repeal of some unwise and vicious provisions in the odious bounty act of 1885, which cost the counties (other than Philadelphia and Allegheny) fully $150,000 (estimated) in less than two years. It has been clearly shown that a very large part of this money was expended for the killing of birds and other animals which preyed almost exclusively on insidious insect foes and voracious mice that yearly destroyed probably fully ten per cent. of the cultivated crops.

Birds and certain other kinds of insect-destroying animal life are the agencies designed by Divine power to keep in check such pests

when they invade man's fruitful possessions. If, through unjust prejudice, brought about by ignorance and greed, we disturb nature's balance, but one result is the logical sequence, namely, hardship and great money loss to farmers and horticulturists, forsooth, a very important class of our State's citizens. Indeed, they are foremost among the people for whose succor your branch of the State administration was created.

From replies to circulars, by correspondence and through other avenues, we find, I regret to say, a strong sentiment in favor of perpetuating bounty laws, which in some form or other have existed since the days of our Puritan ancestors.

The payment of liberal premiums is favored by many of our citizens for numerous kinds of birds and animals which they appear to believe do little else but catch poultry, game and fish, and when tiring of such food, they, or at least some, visit the farmer's premises to devour the young of sheep, pigs or horned cattle.

Strange as it may seem, many of the birds and other animals for which bounties are urged are, contrary to prevalent impression, species which subsist mainly on detrimental forms of animal life, such as May beetles, white grubs, cut worms, army worms, grasshoppers, mice, etc.

Many sportsmen and some fish culturists favor a liberal bounty for the tufted head of the kingfisher because he catches trout, bass and different kinds of small-sized fish. The osprey, or fish hawk, the great blue heron, the night heron and the familiar fly-up-the-creek or green heron, which is also known by other common names much more expressive than elegant, are condemned in strong terms and their extermination advocated.

Several countries on the continent have tried the experiment of paying bounties for fish-destroying birds and quadrupeds with results that have proven most expensive and othewise unsatisfactory.

It is hoped that this Commonwealth's lawmakers and governors will never sanction measures which encourage the destruction of the lively and noisy kingfisher and the little remnant of the heron family which frequent our streams, lakes and ponds.

The sparrow, introduced from Europe, like a good many other bad things which have crossed the ocean to plague honest and industrious American citizens, is another one which is, very properly, in bad repute.

Because this bird commonly, but incorrectly, called English sparrow, does a great amount of damage, the cry "place a small bounty on the sparrow," is heard. If this species could be eradicated by such an expenditure of public funds, it would be money well spent.

However, a premium for the head of the worthless English sparrow would not cause his extermination, but it would, through ignorance

and fraudulent practices, I have no doubt, bring about speedily a large outlay of money and also the destruction of perhaps not less than a hundred kinds of small wild birds, which designedly or through ignorance, would be slain and sold for English sparrows.

The State Game Commission.

The members of the Board of Game Commissioners, without pecuniary aid, other than that which they raised by voluntary contribution, have in the short period of their official life done most efficient work. The famous Harris game bill, which is one of the best laws for the protection of game and wild song birds in the United States, was framed by these gentlemen who spent liberally of their private funds and devoted much valuable time in its preparation.

This measure is one that is not of interest alone to lovers of field sports; we find certain of its important and restricting clauses will, ere many years, if properly enforced, result in untold benefits to farmers and fruit growers, as it gives a much needed protecting hand to the sorely persecuted insectivorous birds. Thus it can be seen that critics who have complained about "too much attention given to game legislation, etc.," had little foundation, in fact, for their utterances, prompted doubtless by jealousy and pique.

The Board of Game Commissioners have accumulated, notwithstanding the serious losses it incurred by the February fire, a considerable mass of interesting facts relating to various matters, which when published will be of great interest and benefit to the citizens of Pennsylvania.

The good effects of the game bill, approved June 4, 1897, are already manifest. Reports from almost every county, show that the efficient corps of game protectors and their assistant deputies are doing effective work. The efforts of these gentlemen, whose duties are to see that the provisions of the law are strictly enforced, are, fortunately, made in such a manner as to meet with earnest popular approval.

For some years past this Commonwealth has been plagued with individuals who made a regular business of killing, in and out of season, various species of game birds and mammals for the market. Again another class of individuals wandered about the rural districts in different parts of the State to slaughter the innocent, bright-plumaged song and insectivorous wild birds for the few paltry dollars their skins were worth to the millinery trade.

The Game Commissioners are determined that such evil practices shall be at once abandoned. They have given strict instructions to their chief game warden and his subordinates to prosecute without fear or favor professional market hunters and taxidermists who may continue to pursue their nefarious and illegal occupations. No cer-

tificates to collect birds and game mammals for scientific purposes as required by the act of 1897, will be granted by the Commissioners if there is any reason to believe the persons applying for the same will use this power in any improper way.

Special Investigations.

Last summer I was authorized by the Deputy Secretary of Agriculture, Professor John Hamilton, to institute, as time would allow, special investigations as follows:

1. Field Mice, and Best Methods for their Destruction.
2. Grasshoppers, and How to Get Rid of Them.
3. Lice and Other Insects which Annoy Cattle.
4. The English Sparrow and its Relation to Agricultural Interests.
5. Currant, Grape, and Gooseberry Destroying Insects.
6. The Wheat Weevil and Wheat Midge.
7. White Grubs.

Investigations in these several diverse branches of zoology have been begun, and considerable instructive and valuable matter relating thereto is on file.

Three thousand circulars relating to the English sparrow, other common birds and animals, have been distributed to citizens throughout the State, and a large quantity of instructive and valuable data has been received from farmers, fruit-raisers, poulterers and naturalists, from all parts of the Commonwealth. The material collected from correspondence in relation to the English sparrow is especially replete with interest, and this when published with the detailed results of several hundred stomach-examinations made by the zoologist and his assistants, of these little naturalized feathered pests, taken at all seasons of the year, will demonstrate exclusively that this passerine bird is a curse to any civilized country where it becomes naturalized. Outward observation and post-mortem dissections demonstrate beyond all doubt that the sparrow destroys cereals, ripe fruits, buds and blossoms of shade and fruit trees. The tender growth of the grape and other vines are choice morsels for him; he delights to devour, under the eyes of the good house-wife, the early garden produce, and when he tires of succulent vegetable-food, his depraved taste leads him to kill the young or eat the eggs of valuable insect-destroying birds: such as wrens, bluebirds, flycatchers, orioles, etc., which love to make their homes about human habitations.

Some Work For 1898.

The work, in part, which I hope to do in the coming year will be:

1st. The preparation so as to be ready for publication, as bulletins or special reports, of the miscellaneous data which has been collected

and is on file in this office, which relates to insects, and remedies for their destruction; birds and mammals, i. e. the common species and their relation to the farmer and fruit-growers; likewise the bounty records with a large mass of matter showing the enormous annual loss sustained by poultry raisers and farmers through the visits of predatory birds and mammals.

2d. I have also nearly ready for publication in such manner as you shall deem most suitable, a report descriptive of some "Rare Summer Birds, and Certain Favorite Hunting and Fishing Resorts in Pennsylvania and Neighboring States."

3d. Knowing as I do, that it is your wish to have new and original work done under your direction, I have planned a series of systematic field investigations for the year and will, with competent assistants, devote particular attention to the study of certain common insects and by careful experiments endeavor to ascertain better means, than are at present known to economic entomological science, for successfully combating these insidious foes, which annually ruin our cultivated crops to the extent of certainly not less than $2,000,000.

4th. The energetic work of my efficient colleague, Dr. J. T. Rothrock, has aroused public sentiment to the importance; yes, the imperative necessity of protecting and perpetuating forest trees. To do this successfully our citizens should have a clearer understanding of the crawling and winged insect hosts which infest many species of the forest and shade trees. The insect enemies of trees and shrubbery are legion. It is my intention to give attention to many of this large class of tree destroyers, and also the birds and other natural agencies, which the wise Creator placed in our midst to keep in check these voracious pests which as Dr. Coues remarks, are "singly insignificant, but collectively a scourge."

Miscellaneous Papers.

No. 1. Ravens, Crows, Jays and Shrikes. This paper deals quite fully with several birds, about which inquiries are almost daily made at this Department. The relations which these birds have to man is plainly shown by careful investigations conducted in both field and laboratory. The paper is written from an impartial standpoint and explains the bad habits as well as the good traits in the lives of these well-known birds.

No. 2. Skunks and Their Economic Value. Two forms of these exceedingly prolific and badly abused animals, which prowl about in twilight and dark to prey on insects, destructive larvae and field mice, occur in Pennsylvania. Skunks are probably the most valuable of all our mammals, so far as the interests of agriculture are concerned, notwithstanding the fact that they will sometimes devour the eggs of a

clucking old hen, or pillage nests of wild birds which breed on or within reach of the ground. The paper contains many interesting and valuable contributions from practical farmers, poultry raisers and sportsmen. It explains the habits of these animals so zealously protected by the hop-growers of the Empire State, where they consume immense numbers of "white grubs" which have recently caused much loss to crops in Pennsylvania.

No. 3. Some Household Pests and How to Get Rid of Them. This paper has been prepared in consequence of repeated requests which have come to this office for such literature. The paper is one which will be very acceptable to the good housewife, as it deals in a brief way with some very troublesome insect pests which so often defy her most painstaking efforts to eradicate.

No. 4. Miscellaneous Natural History Notes. This far reaching and somewhat indefinite title is the caption of a paper which treats of many facts of interest and value on a number of species of birds, mammals and insects. The data it contains will be appreciated by zoological students, and at the same time be instructive to farmers and horticulturists.

No. 5. Pests. We have in the ample field of nature certain species of birds and mammals, as well as divers forms of insect life, which annually do great damage to man's interests. This paper entitled "Pests" relates to some common species which, in recent years, have attracted considerable attention because their habits militate against mankind.

No. 6. Some Interesting Facts Concerning Game. This paper has been prepared to meet a very large demand which is made by educational people, school children and lovers of field sports for such matter.

In consequence of the steadily increasing popular interest in zoological science and outing excursions, which latter diversions are engaged in by all classes, it has been deemed advisable to incorporate in this paper data which will show where the sportsman, angler, student and tourist can go to find the object of his desire, whether he goes in quest of game, fish, knowledge, recreation or health.

All of which is respectfully submitted.

B. H. WARREN,
State Zoologist.

REPORT OF THE COMMISSIONER OF FORESTRY.

HARRISBURG, PA., January 1, 1898.

HON. THOS. J. EDGE, SECRETARY OF AGRICULTURE:

Dear Sir: For a division which has been in existence but two years, operating in a field practically new to our people, with our plans to formulate, and our methods of work to develop, we feel that a most gratifying start has been made.

It was something to convince a people, who had grown up in sight of forests supposed to be inexhaustible, that they would do well to consider the economical methods of lumbering which are practiced in regions where timber is scare, and to provide by wise legal enactments for a restoration of the forest wealth upon which so much of our past prosperity has depended. We can hardly yet realize the full import of the change in public sentiment which has come about so swiftly but so quietly in this State. It is fair to add the strength of the forestry movement in Pennsylvania is a surprise to those in other states who are working with the same object in view.

The whole work here has been done along educational lines. That so much has been accomplished is simply evidence that our people, through their representatives, may be trusted to act wisely upon any question which has been fully stated and fairly placed before them.

Some of the work contemplated by the creation of this division has involved changes in legislation which a few years ago would have been considered as radical, yet the public has already placed the seal of its approval upon them. For example, it has been an established policy of the State, from the earliest period of its history, to dispose of its land cheaply enough to induce settlers to occupy it all as speedily as possible. There was wisdom in this in former years. But we have clearly outgrown the conditions then existing, and the necessity for a change in policy has become apparent. It is now a cause of regret that the need for a change was not discovered before the State had disposed of practically all of its lands. It is now recognized that the good of the largest number requires that a certain portion of the soil should remain as public property, to be managed for the public, in order that the natural laws upon which the prosperous perpetuity of the State depends be not violated, and the very surface of the soil, out of which so much of the wealth and all of the food comes, may be preserved in productive condition.

It was once considered the very essence of equity that all private real property should bear its proportion of taxation, and upon this idea those who prepared the last Constitution of the Commonwealth acted. It now appears that we were leading many of our best citizens by the too rigid application of a sound general principle, to despoil the State, in self-protection. It was the result of a better insight into the relations of the forests to the public that brought a rebate of taxes upon the growing farm timber, which returns to the community at large a benefit for every day that it is allowed to stand. This comes as a direct relief to the depressed agricultural industries of the State.

Just here another principle may claim brief attention. The care which a savage extends to the sick of his own immediate band, civilization has developed into a right on the part of an afflicted citizen to demand care when he is unable to "do for himself." The outgrowth of this idea is seen in every hospital for which the Commonwealth provides. But even this will fail to meet calls which the near future may press upon us. Just as the most rational medical practice is preventive, rather than curative of disease, so the broadest statesmanship will diminish the cost of curing disease, by preventing it, whenever a legitimate function of government can be brought to bear upon the case. Instead of so many hospitals we may have some sanitariums located among the birch and balsam forests. This is neither sentiment nor fancy. It is an event of the next few years. It will be entered upon because of the cold business fact that it is the cheapest thing to do, and because it will destroy a large proportion of invalidism by preventing it, and will give a self-supporting capacity to those who otherwise would have become perpetual charges upon the community. The forest reservations which have been authorized by act of the Legislature will have a large share in the natural development of this idea. The bill creating them was introduced at the request of the Pennsylvania Forestry Association. It should be stated here that the Forestry Division of the Department of Agriculture rendered all proper assistance in making its passage possible.

Then, too, we should call attention here to the change in public sentiment in regard to land sold for taxes. It is but a few years since the idea was broached that the State should become the possessor of them. The favor it met with was but scant. During the past session of the Legislature a bill providing for this was introduced as one of the measures suggested by the Division of Forestry, endorsed by the Department of Agriculture and desired by His Excellency, Governor Hastings. It passed by a practically unanimous vote. No law enacted during the session has been more heartily and universally commended over the State.

This bill, however, marks another stage in our passage to a more rational estimate of the relations of the forests to the community at

large. Becoming State property, such land would no longer be subject to taxation. In reality this is but little hardship to the counties in which it lies because as a matter of fact it now yields little or no revenue from taxes. Under the old law it must have continued to yield less with each successive year, while at the same time it would have become constantly poorer, and have led to a serious derangement of the water flow and water utilization, which would have wrought vast injury to the farm lands below, by freshets on the one hand, and a deficient water supply in dry seasons on the other.

Averting these disasters will be a public benefit which will not be confined to the counties themselves but will extend to the manufacturing and agricultural interests of the regions adjacent along the lower courses of the streams. *The increase of the forest areas, which it is safe to expect under State control, will also tend to lessen the rapidity of evaporation from the cultivated areas, and thus to a certain extent will protect the maturing crops in the season when moisture is most required. With a reasonable prospect of such advantage to the community at large, we may anticipate that any loss to the counties will be more than made good, and that means will be discovered of an equitable relief to the counties for any hardship which might be brought upon them.

There are counties in this State which have hitherto placed so high a tax upon some of their most valuable timber lands, and at the same time afforded so little protection to them against fire, that the owners have been driven to cut the timber, and thus to render the lands so valueless that they were surrenderd (by failure to pay taxes) to the counties. Thus, by one act, these counties deprived themselves of both timber and taxes. It is hardly necessary to point out that this led to a direct loss to the county in which it was done. It was a wrong to the land owner and to the community, and especially to those who are to follow.

Under conditions hitherto existing, forest restoration, on any large scale, was out of the question. The annual fires, with a merciless punctuality, swept over the lands which had been cleared by lumbering operations, until both the young growth and, often, the soil itself were destroyed. In many cases extensive bodies of mature, valuable timber were killed. We had tolerated this until we ceased to consider it a crime to burn a forest, and had come to regard it as inevitable. We had lost sight of the fact that very often such conflagrations were deliberately started by vagrant, irresponsible persons, on ground to which they had no claim, for no other reasons than to increase the yield of berries in subsequent years. Sometimes it was done from malice, or at other times the fires arose from carelessness on

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* See page 152 of Paper by Mr. Geo. S. Rafter, C. E., published in Vol. XII. Proceedings of the American Forestry Association.

the part of hunters. It should be stated here that the opening of the hunting season is usually marked by an increase in the number of these fires. In some regions they occur most frequently on Sunday, when persons who are worse than thoughtless are abroad in the woods. Comment on such a condition of affairs is unnecessary. It is enough to say that it was not only a disgrace to our civilization, but that it indicated a neglect on the part of the State to accord to the owner of such lands the protection for which taxes were paid.

It is in vain to assert that to have paid for the suppression of these fires would have led to their creation by evil disposed people who desired employment. The obvious duty of a government is to ferret out and punish such offenders, and to protect the law abiding citizen at all hazards. It is for this that the government exists, and failing to do this it neglects its first duty.

The earliest distinct, practical step toward suppression of such crimes was taken when the old act of June 2, 1870, was amended and a penalty clause attached which will compel county commissioners to make an effort to bring such offenders to justice, the State in consideration of the general benefits to be derived bearing a portion of the expenses.

The next practical measure, also originated and sanctioned by the Department of Agriculture, was placing the duty of suppressing forest fires upon constables within whose districts they occurred. It also provides a penalty for failure to perform this duty. Having the right to summon a posse to their aid, there can be no excuse for failure to greatly reduce the losses which the State has hitherto suffered from these annual fires. It should be added and emphasized that no man is required by this act to work without reasonable compensation, and that the Commonwealth assumes a fair share of the pecuniary responsibility.

It is not supposed that there will be no forest fires in the future. Some will inevitably arise. We may, however, look for a decrease in their number and for a more prompt suppression of them when they do occur. Neither do we anticipate that the best effects of this law will follow its earliest operation. It is true, and unfortunate that it is true, that a certain number of convictions must follow before the ignorant or malicious can be brought to recognize the existence of any law. This law will be salutary just in proportion as it is rigidly enforced. An act essentially similar has been in operation in the State of New York. It is worth while to quote for a second time from the report of that Commonwealth that "ten years' experience in the matter has demonstrated that the present law relating to the protection of our woodlands from fire is a practical one. We have reason to believe that the widespread and disastrous fires which threatened the existence of our forests at one time will not recur."

An additional safeguard now exists by the passage of the act which authorizes peace officers to make summary arrest "on view," without a warrant having been previously obtained, of those who may be reasonably suspected of violating the laws for the protection of forest property. This was rendered necessary by the fact that in the woodland counties where such offenses are more frequent and most serions, that the formality of obtaining a warrant usnally allowed the escape of the offender. Such a law has been in operation in Canada and it is believed with good results.

In certain of our counties it is still the custom to burn over ground which has been recently cleared to put it in condition to obtain a crop of grass. This "burning of the fallows," as it is called, has often been done without proper, or indeed any, precaution being taken to prevent its spread. Some of our most disastrous forest fires have been so created. One can readily see that this condition of affairs is a survival from earlier days, when each settler who opened up a home in the heart of the woods was a "law unto himself." As population increases, and as neighbors approach him, the good of all parties requires certain restraints. In conversation with those who have been accustomed to burn their fallows, it was stated in so many words that it was each man's "business to look out for himself." It was not considered the fault of the man who created the fire if it invaded the property of another, but was regarded as neglect in the second party if he allowed it to do so.

One may readily see that the prevalence of such an idea may work untold harm. It compels any citizen to live in what, at best, might be termed an "armed neutrality" with his neighbor. It opens an avenue for malice to wreak itself upon others and is in every way unsuited to the age in which we live. Some states have legislated against it by requiring such work to be done under official supervision, or at least only at proper times and with official permission. It is supposed by many of our citizens that there is no law to prevent one from creating a fire upon his own property when he sees fit, at any risk to that of his neighbor. If brought into court it would probably be discovered that this is an error, and that the legal responsibility can be placed where it belongs. The pleasantest aspect of this special problem is that it is fast working its own solution, and that we may hope accidents from this cause will constantly become rarer.

In connection with forest fires another question may any day be started. For example, "back firing" has long been resorted to as a most efficient method of heading off a previously existing forest fire. That it is open to grave abuse no one can doubt. To illustrate: A fire exists on the land of A. The land of B lies between that of A and C. In order to protect himself C may start a fire along the boundary between B and himself. A change in the wind may occur, and the

fire started designedly by C may burn over the whole property of B. The point is that we have hitherto been using a good remedy recklessly, and legal complications may at any time grow out of it. I am not at present prepared to suggest a remedy.

One reason why the abuses alluded to have been allowed to go so long unchecked is because their serious character was not recognized as fully as now. It was supposed to concern only the land owner. It is clear that there has been a marked change in public sentiment. It is equally clear that there has been a cause for this change. It is probable that the educational influences of your Department, have had some influence in effecting it.

But these laws have a far-reaching, secondary influence which has not yet been alluded to. It is more than probable when prompt, systematic suppression of forest fires comes to be the rule, and the citizens are called upon to do the work, that attention will be directed to the enormity of the crime in a way which has never yet been done, and the men who cause them will come to be regarded as public enemies and culprits. Once public sentiment settles down to this conviction, we may confidently hope for a reformation.

This is the proper place to call attention to a hitherto unconsidered relation of some of the counties to the lands which they now hold because of failure on the part of the owners to pay the taxes upon them. Thus far, they have simply been allowed to go without care or attention. It was a natural consequence that such areas should constantly deteriorate. They were swept over by fires, and browsed upon by cattle, until all of the natural tendency to a fresh growth of timber was practically destroyed. Belonging to the county they were everyone's in the largest sense of the word, and they suffered accordingly. Any squatter or timber thief could do his worst with them almost without "let or hindrance." The time must soon come when the question will arise whether they should not be cared for by the county, in the hopes of a remunerative return.

There are towns in Germany which have for years been practically exempt from taxation because of revenue received from forest lands so managed. It is as least fair to assume when these lands come finally into the hands of the county, that timber thieves, browsing cattle and destructive fires will be kept off. After a few wholesome convictions of law breakers it is more than likely that what timber remains and what comes as sprouts from stumps would, in a few years, show such a marked increase in value as to justify the small cost of such protection.

It is proper in this connection to correct an error which is common over the State. It is generally supposed that forestry begins in tree planting. This is not the case. Forestry begins with properly conducted lumbering operations. Planting is, of all methods of forest

restoration, the most expensive, and is not likely to be resorted to extensively in this country for years to come. Indeed, there is small reason why it should be. With us the first step toward forest restoration, after suppression of fires, is to see that in lumbering, enough of seed trees are allowed to remain to restock the ground. It is not true entirely, or even to any great extent, that the soil refuses to reproduce a crop of the same kind of trees as those which have been cut off. The fact is, it seldom gets the chance to do so, because seed trees are not often left. There is no more reason to expect a perpetual succession of white pine on the same soil, without seed, than there is to look for a perpetual succession of corn on the same field without seed.

There may be a slight advantage given to some fresh kind of tree because of the long previous growth of another kind, but this advantage is hardly marked enough to interfere with the desired crop if an abundant supply of seed is furnished. There are numberless instances over the State in which the abundant second growth of the same species of tree can now be seen. Of course this statement needs the modification which follows. When the physical conditions which once existed, and favored a given species of tree, have been changed by its removal, then some other species may have an advantage. For example, young hemlocks and white pines are extremely sensitive to an intense heat of the sun, and often wilt down under it and die. In the absence of shade a chestnut growth might succeed where the pines or hemlocks would die. But it must be remembered that when our forests are cleared a fire promptly runs through the "slashings," and destroys the undergrowth and the moisture-retaining bed of leaves, which othewise would have protected these young pines and hemlocks. Our own lack of foresight has given an unnatural advantage to the chestnuts, oaks, etc. On the other hand I can now show northern, shady exposures where the spontaneous growth of white pine and hemlock is surprising. These are all questions for "up to date" county officials to consider.

It may be well to give some facts showing that forests can be made a source of revenue. These quoted are from the official reports of Germany, and may be wholly relied upon. From the Dukedom of Oldenburg we have, for the financial years from 1886-7 to 1895-6, as follows:

Year.	Total income.	Total expenses.	Annual net profit.
1886-7,	$41,234	$26,450	$14,784
1887-8,	39,875	27,661	12,214
1888-9,	40,913	26,724	14,189
1889-90,	43,578	26,120	17,458
1890-1,	45,148	27,485	17,663
1891-2,	44,433	27,814	16,619
1892-3,	42,817	27,410	15,407
1893-4,	66,976	31,254	35,722
1894-5,	44,116	30,670	13,446
1895-6,	44,838	30,743	14,095

Or, in other words, the total income from 1886 to 1896 was $453,928; total expenses, $282,331; total net profit was $171,597.00.

The domain forests of the Dukedom of Saxony-Gotha, in the financial year from July 1, 1895, to July 1, 1896, gave the following result:

Total income,	$328,115 00
Total cost of maintenance and administration,	94,469 00
Net annual profit,	$233,646 00
Net annual profit per acre,	3 25

The domain forests of the grand dukedom of Saxony for the financial year 1894 yielded as follows:

Total income,	$224,608 00
Total cost,	165,907 00
Net profit,	$58,701 00
Net profit for the year, per acre,	2 03

A summary of the forest operations of the dukedom of Saxony-Meiningen for the year 1895 shows that 107,085 acres yielded as follows:

Total income,	$445,585 00
Total cost of maintenance and administration,	176,572 00
Total net revenue,	$269,013 00
Total net annual revenue per acre,	2 50

The forest estate of the grand dukedom of Mecklenburg Schwerin contains 268,784 acres. The statement of its operations for the financial year of 1894-5 was as follows:

Total income,	$1,075,119 00
Total cost of maintenance and administration,	314,893 00
Total net profit,	$760,226 00
Total net annual profit per acre,	3 10

In the royal Saxon state forests there are 421,164 acres. The year 1894 shows the following statement:

Total income,	$2,360,489 00
Total cost of maintenance and administration,	856,132 00
Total net profit,	$1,504,357 00
Total net annual profit per acre,	3 57

In so far as these statistics bear upon our forests and their possible production, the natural answer to them would be, that under existing conditions we can hope for no such returns. This is entirely true if we consider immediate returns only. But the reply would require very considerable modification if we consider future possibilities. The facts are that we are nearer a shortage of timber at this moment than we suppose and that it will require years before we have changed our extravagant habits in the use of lumber. Low prices now prevailing are due to two causes—i. e., cheap "cut-rate," transportation on the one hand, and the glut of hemlock caused by cutting these trees to obtain bark on the other.

This condition cannot endure, and when the change comes, as come it will, we may expect much higher prices to rule the lumber market. Then, too, no one can predict the size of the possible demand for pulp wood. Its increase in the last few years has been fabulous. It is an open secret that the pulp manufacturers are at this moment concerned over the source of their future supply.

A Plain Statement of an Important Problem.

The following item comes from the Pittsburg Post, of October 15, 1897:

"Extreme quietness still prevails along the wharves. Up-river packets are enjoying a fair trade, but there is little or nothing done

among the tow boats. The river has not been so low in many years, and the outlook for a rise this month is not promising. Two days' steady rain would be necessary to bring a good boating stage, and pilots do not expect this before November. A few of the prophets, however, cling to the prediction that tows will be taken out before Hallowe'en. The stage of the water at Davis' Island dam last night was 1.3 feet; river stationary."

As a matter of exact record the lowest stage of water at Pittsburg during September, 1895, was 5.3 feet. In September, 1897, the lowest stage there was 5.2 feet.

This statement is both startling and suggestive, especially when taken in connection with the following information, kindly given by the National Weather Bureau, through Mr. E. R. Demain, the observer at Harrisburg:

"Deficiency of rainfall at Pittsburg from January 1, 1895, to October 15, 1895, was 9.47 inches.

"Deficiency of rainfall at Pittsburg from January 1, 1897, to October 15, 1897, was 3.55 inches."

It would seem from the above that in 1897 the water was lower at Pittsburg than in 1895, though the deficiency of rainfall was in 1897 less than one-half (exactly 37 per cent.) what it was in 1895.

Facts of similar import reach us from other stations. Thus, at Philadelphia, the deficiency of rainfall from January 1, 1895, to October 15, 1895, was 7.42 inches. From January 1, 1897, to October 15, 1897, it was 0.61 inches.

From Erie, Pa., we have these figures, thus: deficiency of rainfall from January 1, 1895, to October 15, 1895, was 8.20 inches. Deficiency from January 1, 1897, to October 15, 1897, was 5.16 inches.

At Harrisburg, Pa., the deficiency of rainfall from January 1, 1895, to October 15, 1895, was 18.95 inches. From January 1, 1897, to October 15, 1897, it was 11.31 inches.

This is one of the problems to be accounted for and remedied if possible. It is evident that there are too many elements of state and national prosperity involved here to permit of any shortage of water power if it can be avoided.

Of course it will be noted that these rainfall data were taken in Pennsylvania, though the origin of a portion of the water supply of Pittsburg is quite beyond our borders. There can, however, be no doubt but that over a large portion of the Allegheny and Monongahela basins the rainfall was greater than in 1895, yet these streams seem to have been lower. There can be no doubt as to the essential fact—that in our periods of annual minimum waterflow, our rivers are delivering less water in each successive year. Thus, the most reliable

estimates at hand now (from Mr. Henry Birkinbine) give the following for the Schuylkill river in its periods of least annual flow at Philadelphia:

1816, there were sent down 500,000,000 gallons daily.
1825, there were sent down 440,000,000 gallons daily.
1874, there were sent down 245,000,000 gallons daily.
1875, there were sent down 245,000,000 gallons daily.
1878, there were sent down 220,000,000 gallons daily.
1881, there were sent down 215,000,000 gallons daily.
1895, there were sent down 195.000,000 gallons daily.

If these figures are correct, as they probably are, it would seem that in 1895 there was available at Philadelphia only 39 per cent. of the water there was in 1816. Or, in other words, that in eighty years 61 per cent. of the water that should have been available during autumn in the Schuylkill, at Philadelphia, had disappeared—that is, if we assume the reported flow of 500,000,000 gallons as a fair average minimum flow for earlier years.

There is a striking fact in connection with the table just given. It is the progressive decrease, and as if to reinforce the belief in the general accuracy, it will be noted that in 1874 and 1875 the flow is stated roundly at 245,000,000 gallons. It is hardly probable that there will be any dispute over the general statement that we are having less flowing water available at the critical season of the year than formerly. How it is to be accounted for is quite another question. Three explanations might be, or are, offered:

1st. That we are passing through a period of less rainfall than formerly.

2d. That the disastrous change is due to disturbing the former balance of natural conditions by removal of the forests.

3d. That much of this missing water has been used before it reaches the point or points at which the estimates were made.

Taking the last of these explanations first, it may be briefly stated that it does not seem possible, or even probable, that the deficiency of flow can be caused by use of water, because, in the first place, the diminished flow is often as marked at the head of the streams, and above any point of use, as it is below. In the second place, very much of what is used is not carried out of the country by the users and must again find its way into the soil, or stream, at, or near, the point of use. In the third place, for that which is carried off by locomotives, either as water or as vapor, almost as large a portion is returned in the one form or the other to the region from some other points. It would be very interesting to learn the exact quantity of water consumed by our railroads.

Of the two remaining explanations that which seems least applicable to existing conditions of water flow is the one which assumes a

diminished rainfall, because sufficient data are not yet available to settle the question as to whether or not there can be fairly said to be any decrease in the quantity of water delivered from the sky—even in recent years. In fact there are places in which we know that during twenty years past the later decade has yielded as much rainfall as the earlier one. Or, if we include in our estimate a term of years measured by centuries and raise the question as to whether or not we are undergoing a cyclic period of drought as compared with earlier periods, then we are simply invoking an hypothesis which itself requires defence.

It, of course, would explain the present diminished flow if we could prove a diminished fall extending through a long term of years, but in seeking and offering such an explanation we are assuming as true that which requires to be proved. The term "cyclic change" is euphonious and seductive, but as a matter of fact we know as little about cyclic changes as we do about almost any terrestrial condition. In reasoning with them for a basis we argue not upon what we know, but upon what we do not know.

Apropos of this we may quote from Bulletin D, United States Department of Agriculture, page 18, "Rainfall of the United States," by Alfred J. Henry, Chief of Division: "It is true that suggestions of a faint periodicity have been found in some regions of the globe, but it is still the general belief that the vicissitudes of rainfall, if not wholly fortuitous, are so intermingled with the variations of pressure, temperature, etc., that no satisfactory solution of the problem will be reached until the greater problem of the general circulation of the atmosphere has been solved."

In the Monthly Weather Review for September, 1897, page 395, Prof. H. A. Hazen has gathered together the scattered data which seems to prove more clearly than ever before that the removal of our forests has not appreciably diminished our rainfall—l. c. p. 397, he says: "Observations of this nature, condensation in or over a forest, however, can not ordinarily be checked by instrumental means, but show in a general way that the forest tends to conserve vapor and moisture, which, in the case of the open field, would be diffused into the atmosphere."

There would remain then, the assumption that this diminished flow comes from some change, or changes, made in the hitherto established balance of nature. Of such possible changes the one most frequently invoked is the removal of the forests. These are some of the facts which appear to bear upon the case:

1st. It seems to be proven that there is a diminution in the volume carried in our streams during the dry season, and that this is marked over wide areas.

2d. It is certain that our woodland areas in which water is hoarded are decreasing, and that in the same measure our areas of rapid evapo-

ration, and from which the water flows with greater rapidity after the ground is saturated, are being increased. This period of eighty years, from 1816 to 1895, during which the autumn flow of lthe Schuylkil seems to have been gradually diminishing, is too long a reach to be explained by any cyclic change of which we have any exact instrumental record—and certainly the cyclic explanation must be open to question. The decrease in water flow becomes all the more striking when it is noted that the deficiency of water occurs just at the time when we should expect the effects of the summer evaporation over cleared areas to be most marked.

3d. Any excess of water which flows out of the country in a freshet leaves so much less in the country to maintain the even, average flow of springs and streams.

4th. Competent engineers inform us that as between two similarly situated and conditioned regions, the one, however, being treeless, and the other being timber clad, the latter will absorb of the water which falls, and of the snow which melts, about three-fifths more than the former.

5th. Many of our smaller streams, which once flowed the year through, are now, for a portion of each summer season, either absolutely dry, or nearly so. This is ordinarily supposed to mean merely so much water cut off from the larger streams by previous stages of high water. But as a matter of fact it means also a dry atmosphere over a large portion of our cleared areas, which dry air evaporates, by so much, the water from the larger streams. We cannot here give the exact ratio of evaporation, but it probably aggregates an immense volume of water.*

6th. It is now frequently seen that the "green woods" burn in our forest fires, and that formerly they very seldom did so. This means that the normal condition of a saturated atmosphere which once existed has changed, and that, instead, we have an air from which much of the moisture has been evaporated, because the forest areas of slow evaporation have been changed into cleared areas of rapid evaporation, and that the latter areas tend to a constant equalization of the quantity of moisture in the air by drawing upon and drying out even the green woods.

7th. While our river guages have thus far not clearly indicated periods of higher water, the fact remains that our county commissioners are continually raising the height of our bridges above the stream to keep them out of the way of the flood.

It would thus appear that in the loss of water retaining power in the cleared ground and in the increase in the rate of evaporation over the remaining water surfaces there is good reason to associate, at

* Mr. Rafter (op. cit. p. 157) writes, "I reach the conclusion that the deforestation of a drainage area will, in the state of New York, probably decrease the annual water yield of that area from four to six inches."

least in part, the unusually low water during our summers with the removal of our forests.

Of course no one desires to see any suspension of legitimate lumbering interests. The whole object of the forestry agitation is to perpetuate the lumbering interests, and in protecting them also to insure for the State an abundant water power for the future. We may well weigh the statements in the "Manufacturers' Gazette," for October 30th, page 12, where, under head of the gratuitous power furnished by nature, the following occurs:

"Districts long neglected must become populated. Consider what the Falls of Montmorenci might do for Quebec; what the Falls of Ohio might do for Louisville. How Maine will grow when the Penobscot and Kennebec shall have been properly harnessed! Think of the transformation that must go on in our Susquehanna Valley when the water's energy shall have been turned to full account. No state in the Union is more suited to this sort of evolution than Pennsylvania, with her uncounted copious streams in fertile valleys and her great natural wealth. Some such transformation seems bound to come; and it would be no greater than has twice been wrought in this century, first for hand labor, and then by the general introduction of steam. The use of steam is an artifice. The nearer we get to nature, and the free use of her gifts, the less we depend upon the artificial."

Under existing conditions, where is the loss of water power to end? This raises one of the most important questions before our thinkers, workers and legislators to-day.

For a thoroughly exact and reliable solution of the relations of the forests to the water flow of the State, we should require much more information than we now possess. While this is true, it is also equally true that there are certain well-founded principles upon which reasonably exact and safe conclusions may be based, and that in order to formulate information for the public benefit we are justified in using the knowledge we already have.

For example: No one who will weigh a mass of dry leaves and weigh that same mass after it has been exposed to the rain will doubt that leaves possess the power of retaining water. Furthermore, he would recognize that while the water from above readily permeated the mass of leaves, as they lay upon the soil, and entered into the earth, that at the same time these very leaves, being themselves saturated with moisture, would act most efficiently in retarding the evaporation of the surface water in the soil. These facts are so plain that no one can avoid recognizing the water retaining capacity of the leaves which lie upon the forest floor. If we change the point of observation from the forest to the field and study the constitution of the densest sward we cannot fail to recognize that above the surface of the earth no such water-retaining layer exists, or if it is there, it will be less thick and less densely matted. Evaporation will go on much more rapidly in it

than in the forest. Then, too, another point in favor of the forest is the fact that in it the soil itself is more efficiently shaded than in the field. From these observations alone one must conclude that when the land is changed from a forest to a field condition there will follow a large loss of water by evaporation.

It is just as obvious, when one stops to examine, that during a heavy rain the conditions existing in the forest are such as to retain a larger portion of the water than is held by the field. In other words, much of the water, which soaks into the ground in the forest, flows off as surface water from the field and is almost at once carried out of the country.

Let us make this statement as exact as our present information will allow. On pages 17 and 18 of the report of Major C. W. Raymond, United States Engineer, upon Flood Protection of the City of Williamsport, we find the following statement: "Colonel Torrelli affirmed as the result of careful observation that four-fifths of the precipitation in forests is absorbed by the soil or detained by the surface of the ground to be gradually given up in springs and gentle rills. And only one-fifth of the precipitation is delivered to the rivers rapidly enough to create floods. Upon the same slopes and surfaces, denuded of their forests, the proportions are reversed."

That is to say, in the forests four-fifths soak into the ground and in the fields but one-fifth succeeds in doing so—hence then there is a saving by the woods of three-fifths of the water-fall over that of the fields.

It will be interesting to note just what this means. From data collected by this office it appears that in the year 1896, in the counties of Clarion, Forest, Indiana, Jefferson and Warren, in the State of Pennsylvania, the areas cleared of timber aggregated about thirty-two square miles. These counties drain almost wholly into the Allegheny river. It is not possible as yet to obtain the exact annual rain fall for the region. It is safe, however, to place it at thirty-eight inches. The quantity of water falling upon thirty-two square miles would be 4,881,619,353,600 gallons. In an United States gallon there are 231 cubic inches. Dividing the number of cubic inches of rainfall by the number of cubic inches in a gallon, we would ascertain that the rainfall aggregated 21,132,551,314 2-7 gallons annually over the thirty-two square miles cleared. If this rain fall were converted into a stream one foot deep, one hundred and twenty-five yards wide, and which flowed at a speed of four miles an hour, it would require fourteen days, twenty hours, forty-one minutes and thirty-five seconds to pass a given point. If it were converted into a solid cube it would form a mass of water 471.21 yards in length, width and depth.

If the statement of Colonel Torrelli is to be depended upon, the removal of timber from those thirty-two square miles would mean that

four-fifths of this vast volume of water, instead of soaking into the ground to slowly percolate into the streams of the Allegheny Valley and to aid in maintaining an even flow of water, was allowed to run hastily from the surface, into the streams and out of the country. If it did not create a freshet it was, at least in great part, wasted. It was, in other words, so much power rendered unproductive and carried beyond our reach.

It may be that the estimate of Colonel Torrelli is too large. Any authority quoted approvingly by Major Raymond is, however, likely to be as nearly correct as the science of his time allows. We are content to state the case, and without insisting upon these figures, to stand positively upon the principle which they indicate.

The real, practical point for those interested in the future of that region is to determine for themselves where this progressive loss of power is to end.

Is there any probable benefit to be expected in the way of preservation of this water, with the power it implies, by restoration of forests on land, otherwise barren, at the heads of the streams?

If so, is it not supreme folly to delay such restoration an hour longer than necessary?

If forests are not restored to this barren ground, to what other use will it be put?

Can any State afford to have any portion of its areas unproductive?

Do not barren areas reduce the income of a State by depriving it of the revenue it otherwise should yield?

There are two stages more or less clearly defined in the history of every reform movement. One that of agitation, and the other that of actual operation. It appears to be certain that in this State the second stage has been reached.

The forestry operations commenced some years ago by the custodians of the Girard estate in Schuylkill county appear to be in a prosperous condition, and those under the same management in Centre county are yielding object lessons of great value in protection against forest fires. The most notable advance in a practical direction is that made near Ridgway, in Elk county, where on land generously provided by Mr. N. T. Arnold, the general government has undertaken the work of conducting an experimental forestry plantation. This work was commenced with the full knowledge and consent of your Commissioner of Forestry, between whom and Mr. Fernow, in charge of the Forestry Division in the Department of Agriculture, in Washington, there exists a perfect understanding and a hearty sympathy. It is but fair that it should be under direct control of the general government. The location in the heart of what was once the lumbering region of Pennsylvania, is most fortunate, and important results may be hoped for from the experiment. A liberal public spirit would welcome all help of this kind from any source whatever.

There cannot be too many such experiments tried. Whatever benefit accrues from them will be most largely reaped by the region in which they are conducted. For the first time in the history of the State there are indications that some of the large tracts from which the timber has been removed will soon be placed under competent forest management.

In order that there may be no misapprehension or misunderstanding as to the full meaning of the recent legislative enactments concerning forest fires, copies of these have been provided, and it is hoped that early in the new year every constable and every county commissioner within the limits of the Commonwealth will be fully informed upon the new duties which these laws have imposed upon them. We shall also see that they are circulated among such of our citizens as have an interest in them and who would be likely to call attention to any neglect to enforce them.

The public interest in the work of the Division of Forestry is evidently on the increase. Inquiries for information from this office almost invariably receive a prompt reply, and spontaneous offers of help from influential citizens are of daily occurrence. We have sent out during the past year about twelve thousand, five hundred circulars to the officials and citizens of the State. Most of these contained questions upon subjects which were under investigation here. The remainder were reports or copies of recently enacted forestry laws.

Respectfully yours,

J. T. ROTHROCK,

Commissioner of Forestry.

REPORT OF THE DAIRY AND FOOD COMMISSIONER.

HARRISBURG, PA., January 1, 1898.

HON. THOMAS J. EDGE, SECRETARY OF AGRICULTURE:

Dear Sir: I have the honor to report the following review of the work of my Division of the Department of Agriculture, for the year 1897.

Work under the act of June 26, 1895, known as the pure food law, has been effectively carried on in nearly all sections of the State, and under its provisions, I think it is safe to say, that nine-tenths of food adulterations have been banished from the State. The saving in dollars and cents that this amounts to, for our citizens throughout the entire State, is a vast sum every year. The amount appropriated for the enforcement of the law is a mere trifle as compared to the amount saved. The law is generally popular and a large majority of dealers seem disposed to observe it. This makes it comparatively easy to execute.

We were crippled for a time in the proper enforcement of the law from an adverse decision rendered by Judge Hemphill of Chester county, in pronouncing the pure food law unconstitutional, from defect in title. This decision was appealed from, and on April 19, 1897, Judge Orlady filed the following opinion, reversing the decision of the lower court:

Commonwealth vs. William C. Curry.	Appeal from the Quarter Sessions of Chester County. Filed April 19, 1897.

"The defendant was convicted on an indictment framed under the act of June 26, 1895, P. L. 317, in which it was charged that he "unlawfully then and there did sell and offer for sale, as and for, and in imitation of, and under the name of olive oil, used for food by man, a large quantity of a certain adulterated article and compound, the name and components of the said adulterated article and compound being to this grand inquest as yet known," and in a second count "unlawfully did then and there sell and offer for sale, as and for olive oil, used for food by man, a large quantity of a certain adulterated article and compound, then and there being an inferior and cheaper substance and compound substituted for olive oil, the name and components of said adulterated, inferior and cheaper substance and compound being to this grand inquest as yet unknown."

The verdict was set aside and the defendant discharged by the court below; the reason given in an opinion filed was, "As there was no evidence of the sale of an adulterated article of food, it was, at most an imposition or deception in the sale of one article under the name of another, and as the prohibition contained in clauses two and four of the third section are clearly not within the act as expressed in its title, and therefore unconstitutional, the verdict must be set aside and the defendant discharged."

The defendant sold "cotton seed oil" in packages labeled and marked "olive oil," and defends his conduct as lawful because the act of June 26, 1895, known as the pure food law, is misleading, in that the title does not invite an examination of the body of the bill, in which the offense charged is defined as an adulteration.

The learned judge in the opinion filed says: "While the meaning of words depends upon popular usage, the Legislature has the right to prescribe legal definitions of its own language.

But admitting this right, does not the legislative definition quoted introduce into the body of the act entirely new and additional subjects, not clearly or at all expressed in its title, and thus violate the third section of article III, of the Constitution? Both, it is true, relate to food, but the title of the act is not to regulate the manufacture and sale of food, but is restricted to food of a certain character, namely, adulterated food, which the article sold in this case was not." The last part of this statement begs the whole question, as by the act, it and all similar articles ("Second. If any inferior or cheaper substance or substances have been substituted wholly or in part for it;" Fourth. "If it is an imitation of or is sold under the name of an other article"), are declared and defined to be adulterations within the meaning of the act.

It is conceded that the Legislature has the right to prescribe the legal definitions of its own language. A construction put upon an act of the Legislature itself, by means of a provision embodied in the same that it shall or shall not be construed in a certain designated manner, is binding upon the courts, although the latter without such a direction, would have understood the language to mean something different. Endlich on Statutes, section 365. It is legislative language we are to construe, and it must be received not necessarily according to its etymological meaning, but according to its popular acceptation, and especially in the sense in which the Legislature is accustomed to use the same words. Phila. & Erie R. R. Co. vs. Catawissa R. R. Co., 53 Pa. 20.

The sense given to particular words by our great lexicographers is always entitled to weight, yet when a word is used in an act of Assembly, regard must be had to the circumstances surrounding its use. Penna. R. R. Co. vs. Price, 96 Pa. 256.

It is contended that the term "adulteration" is given a special definition by the act by which a new and additional subject is introduced, not clearly, or at all expressed in the title, in contravention of the third section of article III, of the Constitution, "No bill except general appropriation bills shall be passed, containing more than one subject which shall be clearly expressed in its title." We are not required to resort to the technical meaning and derivations of words as given in dictionaries to determine the legislative meaning, when the words are defined by statute, and in this case it is not inconsistent with the common acceptation.

The definition given to the word "adulteration" in this statute is so intimate and natural a connection, so evident an adjunct of the subject and is so closely associated with the word to which it refers that it cannot be held an independent or separate subject, but fairly gives notice of the legislative purpose through the title.

The term adulteration is derived from the Latin adultero, which in its various inflections signifies to defile, to debase, to corrupt, to sophisticate, to falsify, to counterfeit, etc. The objects of adulteration are four-fold, namely, to increase the bulk or weight of the article, to improve its appearance, to give it a false strength, or to rob it of its most valuable constituents.

All these adulterations are manifestly of a designedly fraudulent character, and therefore properly the subject of judicial inquiry. Vol. I, Enc. Brit., Am. reprint, 9th ed., p. 152. Title, adulteration.

It was held in Commonwealth vs. Moore, 2 Pa. Superior Court R. 162, an act, the title to which was, "An act for the protection of livery stable keepers," was constitutional, because the title fairly gives notice of the subject of the act, so as reasonably to lead to an inquiry into the provisions of the bill, which has repeatedly been held to be sufficient, as the title thus inducing examination, accomplishes all that a more elaborate statement would give notice of. Millvale Borough vs. Evergreen Ry. Co., 131 Pa. 1; Keely vs. Mayberry Township, 154 Pa. 440, and Commonwealth vs. Lloyd, 2 Pa. Superior Court R. 6, in which case "An act relating to the county commissioners of Cambria county" was sustained, though the second section fixed the salary of each commissioner, and the third section authorized them to employ a clerk at a fixed salary; and on appeal to the Supreme Court, 178 Pa. 308, the judgment of the Superior Court, was affirmed for the reasons given.

In Commonwealth vs. Robert Muir, 1 Pa. Superior Court 578, an act, entitled "An act to regulate and license public lodging houses in the different cities of this Commonwealth," in which a "public lodging house" was specially defined in limitation of the common meaning of the words, was held valid and constitutional, and on appeal to the Supreme Court, 180 Pa. 47, that tribunal says, "We have considered

the provisions of the act and are all of the opinion that the Superior Court was clearly right in holding that it is constitutional," though it contained subjects not technically covered by the title.

The title to this act, "To provide against the adulteration of food, and providing for the enforcement thereof," would naturally invite inspection by any one engaged in the manufacture or sale of food, and desirous of knowing what was to be avoided in the making and trafficking in the multiform food products of this day.

The attempt to defraud the public in selling cotton seed oil under the guise of a higher priced article of an entirely different name is one of the many similar acts which necessitated the pure food law, and useful and honest legislation should not be defeated by too rigid an adherence to the letter of the Constitution, or pretexts be caught at to void legislation when it can be fairly reconciled within constitutional limits. It is a cardinal rule that all statutes are to be so construed as to sustain rather than ignore them; to give them operation if the language will permit, instead of treating them as meaningless and invalid. Mauch Chunk vs. McGee, 31 Pa. 433.

The title does not tend to mislead, as it invites examination by the very words used, "To provide against adulteration of food, and providing for the enforcement thereof," which reasonably embraces every product; the different classes, kinds, modes of manufacture; and as it was a proper subject for legislative action, all persons, whether manufacturers or dealers, are attracted by the words of the title to a critical examination into the provisions of the bill.

There has been a general disposition to construe the constitutional provision liberally, rather than to embarrass legislation by a construction whose strictness is unnecessary to the accomplishment of the beneficial purposes for which it has been adopted. Cooleys Const. Lim. 175.

In addition to the reasons herein given, we refer to Commonwealth vs. Daniel D. Jones, and Commonwealth vs. Huffnal, filed at this term, in which cases the same subject is discussed.

We do not agree with the reasoning of the learned judge below, and think the title to this act fairly gives notice of the provisions of the act, so as to reasonably lead to an inquiry into the bill.

The assignments of error are sustained. The decree of the court below is reversed, and record remitted for further proceedings thereon."

The question regarding the admissibility of butter colors made from coal tar, was after much controversy, adjusted on the plan of a cautionary notice being on the label, that it should only be used according to printed directions, and also a printed notice of the material of which the color was composed, and the removal from the label the statement that it was a harmless vegetable color.

In a dry mustard case, adulterated with 70 per cent. of wheat flour, that was tried in Monroe county, it was claimed on the part of the defense, that mustard was not an article of food; hence did not come under the provisions of the law. A local doctor was called for the defense and testified that mustard was not an article of food, and further, that it was poison. The State Chemist in rebuttal, testified to exactly the reverse, naming the different properties of which mustard was composed, specifying what was nutritious, and that the trace of poison existing in natural mustard, was eliminated in the prepared article; and that as prepared for commerce, it was not poison, and was an article of food. The court in submitting the case to the jury, charged, that whether mustard was or was not an article of food, was a question of fact for them to decide. As it proved, the jury were divided on the question, and rendered a compromise verdict, acquitting the defendant, but imposing upon him half the costs, and the other half on the county.

In August last, a meeting of the Dairy and Food Commissioners of different states, was held at Detroit, Michigan, and a National Association was organized, with J. E. Blackburn of Ohio, President, and Elliott O. Grosvenor, of Michigan, Secretary.

A constitution, by-laws, &c., were adopted, providing for annual meetings of the association.

We can reasonably expect much good to result from these yearly meetings; where questions of interest connected with the departments of the various states, can be discussed, and views and experiences interchanged. This will be advantageous to all, and result in uniformity of action and construction of the various laws.

The Department of Agriculture at Washington, some time since, authorized Hon. Alex. J. Wedderburn, as a special agent to investigate and report upon the advisability of a national law, governing the subject of adulterations in foods and drinks. He has closed his investigations, but the report as yet has not been published, though I am informed that an act pertaining to this subject, will be formulated and presented at the present session of Congress.

Since my last report a new vinegar law has gone into effect, and all the old laws have been repealed. The legal standard of solids in cider vinegar, is reduced from two, to one and a half per cent. This seemed to have been warranted, from some experimental work carried on under the direction of the Secretary of Agriculture, whereby some sixty samples of known cider vinegar were analyzed by Dr. Frear, by which it was found, that many of the samples fell short in solids of the legal standard as it then existed.

Another important change in the vinegar law relates to color. Artificially coloring in any vinegar is prohibited. As distilled vinegar is colorless or nearly so, and the popular demand is for an amber colored vinegar, manufacturers claim, that an injustice is done to them, by in-

serting this color clause, as the material used for coloring (burnt sugar) is harmless. On the other hand it is claimed, that colored distilled vinegar is often sold as cider vinegar, and that it is imposisble to practice this deception when vinegar is uncolored. The old law required the Dairy and Food Commissioner, to make a detailed report, to the State Board of Agriculture, at their annual meeting of work done under the vinegar act. The new law changes this, placing the whole responsibility of enforcing the law by the Dairy and Food Commissioner, upon the Department, and not upon the State Board of Agriculture, as formerly. The standard of acidity under the law remains as before, at four per cent. or forty grains. At the present time vinegar is generally sold true to name, and much of the deception formerly practiced has been done away with.

Another important act passed by the last Legislature, the enforcement of which devolves upon this Department, is the cheese law. Formerly cheese of any grade could be sold within the State, without restrictions, whether full cream or skimmed, or of an intermediate grade. Often full skim, or any intermediate grades, were sold as full cream; especially was this the case with Ohio part skim cheese, and the result was, that while such cheese might be a desirable article of food, that it was sailing under false colors, and that consumers were deceived as to its quality.

They often paid the value of a full cream cheese when they were getting an inferior and cheaper article. The law referred to not only fixes standards of quality, but requires that they shall be branded "full cream," "three-fourths cream," "half cream," "one-fourth cream," and "skim cheese" as the case may be. The standard fixed is 32 per cent. of fat for full cream, 24 per cent. for three-fourths cream, 16 per cent. for half cream, and 8 per cent, for one-fourth cream, and that all cheese containing lass than 8 per cent. of fat, shall be branded "Skim Cheese."

At first the trade very generally thought that the standard fixed by this law was too high, but repeated analyses of known full cream cheese soon convinced them, that this fear was entirely unfounded, and that the standard of 32 per cent. fat, was a minimum rather than an average standard. Many manufacturers of the State were also in doubt about their ability to comply with the law, and many letters were received at he Department, asking what per cent. of fat in milk, was necessary to produce a 32 per cent of cheese. We explained the matter in this way: that as it takes on an average ten pounds of milk to make one pound of cured cheese, hence a pound of cured cheese, contains (not allowing for waste), just ten times the per cent. of fat, that the milk contained from which it was made.

There always will be some waste of fat in manipulating the curd, the amount depending greatly upon the care with which it is handled.

All good cheese makers strive to retain as much of the fat as is possible, and I think it is safe to calculate, that three and a half per cent. of milk would produce a cheese, that would test up to the legal standard.

This would be allowing three per cent. for waste, from the amount of fat contained in a quantity of milk, sufficient to make a pound of cheese. While there are individual cows, whose milk may show a percentage of fat at three and a half per cent. or lower, yet I very much doubt if there is a cheese factory in the State, at which the milk from the aggregated herds that supply it, will not show a percentage of fat above three and a half, unless there is some skimming done, either by the patrons, or the manufacturer. Factory men who have applied to me for information on the subject, have been advised that they need have no fears of falling short of the requirements of the law, provided, they allowed no skimming done by their patrons, and did none themselves.

Another feature of the law that caused considerable apprehension of trouble among jobbers and wholesale dealers was the clause that required the manufacturer's name and postoffice address, from the fact that many domestic and foreign cheese came into their hands unbranded, and that it was impossible for them to know who the manufacturer was. A liberal construction from the Attorney General of the intent of the law, allowing the dealer to brand his name on the package in place of the manufacturer, obviated this difficulty, and now everything is working very satisfactorily.

I insert the opinion of the Deputy Attorney General in full, as follows:

OFFICE OF THE ATTORNEY GENERAL,
HARRISBURG, PA., October 27, 1897.

HON. THOMAS J. EDGE, Secretary, Department of Agriculture:

Sir: The answer to your request for an interpretation of the act of June 23, 1897, has been very much simplified by the presence of gentlemen representing the trade. From them it was learned that at least three-fourths of the cheese consumed in Pennsylvania is manufactured out of the State, and in many instances it is impossible to ascertain the name and address of the manufacturer thereof. A jobber in New York City, for instance, may buy cheese from any other State or even from foreign lands, and it will be impossible for him, in all cases, to know where and by whom the product was manufactured, and it would be out of the question, in such case, for the wholesale or retail dealer in Pennsylvania to obtain that information.

It is contended however, that the act of June 23, 1897 (P. L. 202), requires the dealer to brand the cheese with the words "Full Cream," "Three-fourths Cream," &c., according to the class to which it belongs,

and also with the name and address of the manufacturer. This last requirement, as we have seen, is, in many instances, impossible of performance. The law does not require the performance of an impossibility. The whole purport of the act above named is doubtless to prevent the sale of any cheese not the legitimate product of pure unadulterated milk or cream, and at the same time provide the means of identifying the person who may be responsible for a violation of the act.

Supposing it were possible to label every cheese manufactured out of the State with the name and address of the manufacturer, how could that aid in protecting the consumer? The manufacturer is beyond the jurisdiction of the authorities of this State, and no punishment can be inflicted on him in case of violation of the provisions of the act of Assembly. It would seem to be more consonant with the purpose of the act to allow the dealer in such cases to mark with his name and address as dealer all such cheese, as thereby he would himself indicate his personal responsibility in case of a violation of the law.

The act also provides that the brands on the cheese shall be in "bold-faced capital letters not less than one inch in height." The gentlemen who appeared before us showed very clearly that in some cases it would simply be impossible to comply with this provision of the law, inasmuch as many cheeses are too small to allow the amount of printing in the type as required by the act. In such case the obvious thing to do would be to come as near as possible to the requirements of the law.

With these observations I therefore advise you as follows:

1. That in case of cheese manufactured in Pennsylvania, you should require the same to be branded "Full Cream," "Three-fourths Cream," &c., as the case may be, and with the name and address of the manufacturer thereof.

2. That in case of small cheeses, you should require the words "Full Cream," "Three-fourths Cream," &c., to be printed in large letters and allowing the name and addresses in smaller type, which, however, should be clear and plain, and which ought not to be less than one-half inch in height in any instance.

3. In the case of cheese manufactured out of the State, it would be a sufficient compliance with the act of Assembly above named, if the dealer would brand the same in the manner indicated, with his name as dealer thereon, and with his address or place of business also thereon. I am fully convinced that in this way complete effect would be given to the act and the interests of the consumers, as well as the Commonwealth, would be best protected.

Very respectfully,

WILBUR F. REEDER,

Deputy Attorney General.

Oleomargarine.

As predicted in our last report, the fallacy of being able to sell oleomargarine legally under the pure food law as a compound not injurious to health has been passed upon by Judge Arnold of Philadelphia, and the position taken by oleo dealers was not sustained. In Pittsburg, however, in a number of cases taken up on a writ of certiorari, the judgments obtained in favor of the defendants for costs were affirmed without, however, passing upon the legal question involved. To my knowledge no further claim has been made that the pure food law legalizes the sale of oleomargarine in this State. In Pittsburg, where large quantities were sold in this manner, a vigorous enforcement of existing laws is being carried on under the direction of Attorney Moore and Agent James Terry, and both friends and foes of the sale of oleomargarine claim with good effect, by greatly reducing the illegal traffic.

The output of oleomargarine has been reduced one-half a million of pounds during the last year as shown by reports from the Internal Revenue Department, licenses, &c.; and two millions as compared with 1894. The amount of oleomargarine manufactured and sold as compared with butter is less than two per cent., and while it has an injurious effect upon the dairy industry, it is not the only cause leading to the prevalence of low prices for dairy products.

Renovated or made over, sometimes known as boiled, or process butter, is on the market in large quantities, and this has a depressing influence on prices. It is produced from a grade of butter which, before it is manufactured, brings only about what it is worth for soap grease, in fact the lowest grade of butter to be found in country stores. The fat is rendered from it by boiling, and this is the only portion used. It is deodorized and again churned in milk from which it derives about the usual amount of casein. After churning it is washed, salted and worked much as ordinary butter is treated. It has not the grain of ordinary butter and when tried by the heat test, it behaves like oleomargarine. As it contains no foreign fat it cannot be classed with oleo, and its sale prohibited under the act of 1885, though as an article of food it is doubtless more objectionable than oleomorgarine, and it is liable to become as great a menace to legitimate dairy interests. Some cases have been brought under the pure food law in Philadelphia against its sale, but what the final outcome may be cannot yet be determined.

Since my last report another fraud in butter manufacturing has been unearthed. This seems to have been confined to creameries, and we have prosecutions now pending in Montgomery county. A material called a cream ripener but in reality a low grade of cotton seed oil and stearine is added to the milk or cream before churning. This, of course, increases the yield and the profits, and when used in small

quantities it is difficult to detect. It is not only a violation of the pure food law, but also of the United States Internal Revenue laws, for one using this foreign fat with butter becomes under the statutes, an oleo manufacturer, and subjects himself to the penalties in not having taken out a license. It is to be hoped that the few prosecutions brought may have the effect of preventing any further infringement of State and National laws by such fraudulent practices among creamerymen.

Strenuous efforts were made at the last session of the Legislature to get some new act governing the sale of oleomargarine, that would under certain conditions, legalize its sale. One bill contained a clause that it should not be colored yellow in imitation of butter. Another bill introduced included a license system. Had this act become a law, it would have been a source of considerable revenue to the State, and, owing to the falling off of revenue and the necessity of increasing the same, this plan at one time had quite a strong following. When, however, members from the agricultural districts began to hear from their constituents, they found that public sentiment was against such measures, and the idea of raising revenue from this source was abandoned.

Some prominent dairymen who do not fully approve of prohibitory laws recommend in their place what are generally known as color laws, and acts of this kind are now in force in the following states, namely: Colorado, Illinois, Iowa, Massachusetts and Michigan. In Vermont and West Virginia it can be legally sold when colored pink.

After strenuous efforts a law of this kind was passed last winter in Illinois, prohibiting the manufacture or sale of oleomargarine colored yellow in imitation of butter. The law, however, seems to be disregarded as there is no apparent difference in the color of the goods they turn out from Chicago from former years, though a bill one of our agents secured had stamped upon it "Uncolored Butterine" which might be called "obeying the law by letter" if not otherwise.

While business depression has so generally prevailed, daily interests have suffered, though as we believe, in a lesser degree than most lines of agricultural pursuits.

Adversity is a stern teacher, and many useful lessons are thereby imparted. Dairymen are thus brought to realize the absolute necessity of a rigid inspection of their business in view of retrenchment and economy; seeking whereby expenses can be lessened and profits increased. To this end one very important consideration is to fix upon a high standard of excellence for the product placed upon the market, whether it be milk and cream or the manufactured article of butter or cheese. I have always maintained that if all of the butter offered for sale was up in quality to the high standard of excellence that it might, and should be, that this alone would settle the oleomargarine question.

The main cause of the demand for oleomargarine arises from the fact that so much poor butter is found on our markets; to raise the standard to its proper plane would seldom require any additional expense, but simply to do the right things at the right time in a careful manner, associating with the work painstaking methods derived from an intelligent study of the subject.

Another year's experience has clearly proven the value of the laws relating to pure food, vinegar, lard, and other food products, and it is difficult to even estimate the saving which their enforcement has given to the people of our State, and it is also evident that their enforcement in the future will gradually become more easy as our people and especially as our retail dealers in food products become educated to the improved methods inculcated by a strict compliance with the law. I am again able, with increasing force, to call attention to the good effects which have been produced by following the advice of the Department in requiring guarantees from wholesale dealers as to the character and purity of the goods purchased; such guarantees practically relieve the retail dealer from all responsibility, provided the wholesale dealer is responsible for his guarantee.

Respectfully submitted,

LEVI WELLS,

Dairy and Food Commissioner.

REPORT OF THE STATE VETERINARIAN.

HARRISBURG, PA., January 1, 1898.

HON. THOS. J. EDGE, Secretary of Agriculture:

Dear Sir: I have the honor to submit to you the following report on the work of the Veterinary Division of the Department of Agriculture and of the State Live Stock Sanitary Board, for the year 1897.

During the past year this work has assumed large proportions, and it is still increasing in volume, and, I believe, in importance to the live stock interests of the State. For the sake of convenience it may be classed under the following heads:

First. The examination of animals reported by owners or veterinarians as probably afflicted with dangerous, contagious or infectious diseases, and advice and the employment or enforcement of curative or preventive measures in connection with the same.

Second. Correspondence and advice in relation to the treatment of diseased animals and the prevention of disease.

Third. The inspection of tuberculous herds upon written request from their owners and the appraisement and destruction of tuberculous cattle found in such herds.

Fourth. The supervision of the inspection of dairy herds for the purpose of granting certificates showing their condition, such certificate being used by the owners to advance the sale of their product.

Fifth. The laboratory study of diseases that are as yet imperfectly understood for the purpose of ascertaining new facts in reference to their causes and the means that may be employed to prevent them or for the purpose of making or confirming a diagnosis. The laboratory has also produced all of the tuberculin, mallein, and anthrax vaccine used by the Board during the past year.

Sixth. The preparation of articles, reports and bulletins on subjects relating to the health of live stock.

Seventh. The inspection of dairy cows and neat cattle for breeding purposes coming into the State as provided for in the act of May 27, 1897. Although this act does not go into effect until the first of January, 1898, and actual inspections under it have not actually commenced at the time of this writing, it has been necessary to devote much time and attention to preparation for this inspection and to furnish information to shippers and others in reference to it.

Eighth. The investigation of the diseases of animals under the provisions of the act of June 15, 1897.

If the rapidity with which the work of the State Live Stock Sanitary Board has increased can be regarded as an index as to its necessity and value we are justified in assuming that work of this character is both urgently needed and highly appreciated. In fact, the growth of one portion of our work, that relating to the inspection of herds for tuberculosis, has grown to such large proportions that it has been necessary to restrict it in several ways.

Applications from herd owners for examinations of herds and tuberculin tests have been received in such large numbers that it has been quite impossible with our available resources to comply with all of them. Hence, the plan has been adopted of requiring each applicant for a test of herd to state his reasons for believing that tuberculosis exists among his cattle. Where these reasons are deemed sufficient the inspection is made, but unless there is good reason for this belief the owner of the cattle is furnished with information in reference to tuberculosis, the manner in which it spreads, the means to be adopted in combating it, etc., and is told that it is necessary to restrict inspections to herds in which the apparent danger is greatest. This plan has served to restrict the work directed toward the suppression of tuberculosis to the worst centres of disease that have been brought to our notice, and the percentage of tuberculosis found under these conditions is necessarily very much higher than the percentage of tuberculosis among all of the cattle in the State and furnishes no basis for an estimate as to the percentage of tuberculosis among the cattle at large. However, the statistics of the tuberculin tests of cattle for the last six months, as compared with those made previously, present a remarkable significant feature.

The number of cattle tested up to 1st of June, 1897, was 9,108, the number of these that were found to be tuberculous and condemned was 1,839. The percentage of tuberculosis, therefore, was 20.39. Since the 1st of June, 4,887 cattle have been tested with tuberculin and of these 671 were found to be tuberculous and killed, equivalent to 13.73 per cent. Considering the manner in which the herds to be tested are selected and the wide distribution of the work, covering practically all parts of the State, it would seem fair to assume from this showing that many of the most thoroughly infested herds have been discovered and disposed of, *and that the percentage of tuberculosis among cattle at large is being steadily and rapidly reduced.* This is indeed an encouraging condition, and I believe that it justifies the plan that has been adopted for meeting this disease.

At the time of the publication of the last annual report the average appraisement for cattle condemned as tuberculous was $24.42. Since the beginning of the last fiscal year the average appraisement has

been $20.45. The total payments for tuberculous cattle to date amount to $57,191.16 for 2,510 animals. Since the beginning of the present fiscal year 671 cattle have been appraised at $13,714.66, being an average of $20.45 per head as against $22.78 per head for all of the cattle that have been appraised since the beginning of operations, and $24.42 per head as the average for last year.

It is pleasant to be able to report that there is now a general appreciation of the fact that the State Live Stock Sanitary Board is organized and is working for the suppression of diseases that cause great and burdensome losses every year and that its function is to check these losses and assist those who are suffering them. It is recognized by the Board that there are large commercial interests at stake, and that this work should be so arranged and conducted as to interfere as little as possible with the routine of the business of the farmer, and that it should be so managed as to increase confidence in animal products and have a tendency to enlarge the market for them. At the same time, it is believed that the work is without justification unless it has a permanent sanitary value and succeeds in protecting the public and the general live stock interests as well as the individual. This community of interests, this plurality of objects to be achieved and of obstacles to be avoided, has given us a problem that has taxed the knowledge and ingenuity of numerous officials and boards in this and other countries.

Whatever objections have been raised in other states to work looking toward the suppression of tuberculosis of cattle, they are not based on a desire that the disease shall not be suppressed, but upon the methods employed and expense involved. Some of the methods in use elsewhere have placed such burdensome restrictions upon dairy farmers that the measures have become exceedingly obnoxious to them, and in order to obtain a modification of methods they have in some cases objected to the execution of all plans carried out for the purpose of suppressing tuberculosis. This has caused a false impression and in some places led to the belief that farmers are opposed to the whole work of suppressing tuberculosis, but in Pennsylvania this is not the case. The farmers here want healthy herds.

The plan of voluntary inspections that has been adopted has made it impossible for anyone to object to an inspection of his cattle. The question might be raised as to this plan that it does not sufficiently insure the inspection of herds that are notoriously diseased and are supplying milk for the public market and distributing tuberculous animals which carry the disease into other herds. But the answer to this objection is that consumers, dealers and creameries do not knowingly purchase the product of tuberculous cattle. As soon as it is known that a given herd is tuberculous, the market for its product becomes restricted to such an ex-

tent that it is to the business advantage of its owner to apply for a test of his herd and remove the tuberculous animals. Moreover, public sentiment, and the influence of his neighbors will often lead to an application for inspection where tuberculosis is known to exist; but the usual impelling motive is the desire upon the part of the owner of the cattle to avoid a source of danger and of loss.

In my last report I advised the continuance of the present plan of dealing with tuberculosis and in view of the enlarged demand from live stock owners for assistance under this plan and the success that has rewarded our operations under it, I am of the opinion that its general principles should not be changed.

There is, however, an important matter that I should like to present for consideration with a suggestion as to an extension of the present work. Herd owners for whom inspections are made, sign an application in which they agree to thereafter observe the precautions and measures advised by the State Live Stock Sanitary Board for the prevention of the reintroduction of tuberculosis into their herds. Among such precautions is one in relation to cattle purchased for addition to the inspected herds. Owners of such herds are advised to buy cattle only subject to the tuberculin test or from herds that they have good reason to believe are free from tuberculosis. But many dairymen have difficulty in purchasing according to these provisions. They are to buy cattle that are gathered from unknown sources by drovers, shipped long distances, and disposed of at public sales in dairy districts. The seller offers no guarantee as to the freedom of such animals from tuberculosis, and it is known from repeated observation that many of them are so afflicted. The new law and regulations (act of May 27, 1897) will provide that cattle coming from out of the State, when thus sold, shall be tested and the buyer will have a guarantee as to their condition. But cattle carried from one part of the State to another will still convey disease in many cases. This danger is increased by the fact that some unscrupulous persons knowingly dispose of tuberculous cattle through the channels of trade, under the impression that it is cheaper to do so than to report the disease to the State authorities.

Some dealers have already arranged to sell cattle subject to the tuberculin test and in some cases, also, whole herds are inspected and sold with certificates showing that they are healthy. This system is desirable for the purchaser and it has been observed that cattle sell better with a guarantee of this kind than without it. Many of the leading breeders of the State sell cattle for breeding purposes only under these conditions. It is desirable that this system should be extended as much as possible, because when herds become tuberculous it is usually because the disease has been purchased in the body of a cow or bull.

The principal objection, that has been raised, to the more general practice of testing cattle with tuberculin before they are sold is on the ground of expense. It is held that such inspections will increase the price of cattle. While this effect would be a desirable one from the standpoint of the breeder or dealer, if the cost of inspection were not equivalent to the increase in price, it would be injurious to the dairymen in the eastern part of the State who buy most of their cows. It is a fact, however, that in New England, and especially in Massachusetts, where such inspections have been practiced on the largest scale and for the longest time, the price of cattle has not been noticeably increased. Even if there were a slight increase in price, is not the additional security worth an advance of one per cent. on the cost of the cow? However, to do away with this objection, I believe that it would pay, under certain restrictions and conditions, to make inspections of cattle belonging to dealers, upon application from them and without cost to them. The animals found to be free from disease could then be sold with a guarantee as to their condition and owners of sound herds could buy without danger of infecting them. Those that proved to be tuberculous could be disposed of as other tuberculous cattle are disposed of now—by appraisement and destruction. Such action would prevent the spread of much disease.

In reference to other diseases, I would say that my services have been demanded in connection with the following affections, Texas fever, glanders, rabies, hog cholera, osteoporosis, tuberculosis, infectious abortion, black leg, anthrax, fowl cholera, periodic-ophthalmia, red water, strangles, distemper of dogs, garget, influenza and many other diseases that do not properly come within the sphere of public action, because not transmissible. These diseases have involved all species of domestic animals and all parts of the State.

Information and advice have been furnished in letters to more than five thousand correspondents and numerous personal visits and inspections have been made for the purpose of ascertaining the condition of live stock.

The Bacteriologist, Dr. M. P. Ravenel, has been engaged in making mallein, tuberculin and anthrax vaccine, in examining numerous specimens from animals suffering with various diseases that were sent in for identification from all sections of the State, and in conducting much of the original work of the Board.

A special report on tuberculosis is now in preparation, which it is hoped to publish as a bulletin later in the year. Articles on abortion of cattle and on hog cholera are to be found among the papers in another part of this volume, and I attach hereto some facts of current interest regarding some of the diseases that have received special attention during the past year.

Rabies.

In my last annual report I devoted considerable space to a discussion of this affection on account of the great prevalence of the disease during last year and the misunderstanding that so generally exists in reference to it. During the present year, a large number of reports of rabies have been received and considerable work has fallen upon the State Live Stock Sanitary Board in connection with this disease.

There are still a few people who profess to believe that there is no such disease as rabies, or hydrophobia, and lengthy articles have been written and published widely in which it is claimed that all so-called cases of rabies are either myths or some other disease, the nature of which has not been recognized. Such articles and statements have done a great deal of harm, because they render it difficult to carry out the measures that it is necessary to enforce in order to suppress this dreadful malady. It is sufficiently easy to disprove such allegations if their authors are known and will consent to consider the scientific facts that have been demonstrated in connection with this question. But many of these statements are published anonymously, and while they contain no scientific facts to substantiate them they nevertheless tend to unsettle public opinion, with the result above mentioned.

Has it ever occurred to those who really profess to believe that there is no such disease as rabies that the history of this affection dates from the earliest medical literature? It is, in fact, one of the oldest diseases of which there is an authentic record and was described by Aristotle about 400 B. C., who stated, "The dogs suffered from rabies. This throws them into a condition of fury and all animals which they then bite develop rabies."

This disease in man has also been described by the earliest of the ancient physicians and reports of outbreaks occur repeatedly in medical literature from that time to the present. Eminent scientists, and Government commissions without number, have studied rabies and have, in all cases, arrived at the conclusion that it is an extremely dangerous malady, transmitted by the bite of an animal afflicted with it. Contrary views are held by a few individuals who have not had the facilities, inclination or skill necessary to enable them to study this disease scientifically and experimentally.

One of the principal advocates of the view that rabies does not exist bases his opinion largely upon the results of some investigations made by him of newspaper reports of this disease, and he has found that in many instances where it was claimed that dogs were mad no evil results followed their bites, and some people who were claimed to have rabies were, he states, actually suffering from some other disease. It is undeniably true that a great many of the public reports of rabies are wrong and based upon a misinterpretation or exaggeration of certain comparatively harmless conditions in dogs, but it is also undeniably

true that many other diseases have been wrongly diagnosed. Because a certain horse suffering with a discharge from the nose is not afflicted with glanders, it is no indication that glanders does not exist and that another horse suffering with a discharge from the nose may not have this deadly disease. Any one, no matter how prejudiced he may be, who will honestly study the real facts, will be convinced that there is a widespread and altogether too common disease of dogs that is generally characterized by a tendency to roam, by a marked alteration of temperament and voice, frequently by a furious and uncontrollable desire to bite, sometimes by paralysis of the jaw and throat and always terminating in death. A comparatively superficial study of the facts will also show that this disease can be conveyed to healthy animals by the bite of an animal suffering with it, and that the inoculation of animals with saliva or with portions of the brain or spinal cord, taken from the subjects of such disease, will reproduce it, that it can be transmitted indefinitely from animal to animal and that instead of losing strength and virulence by such transmission, it is usually rendered more malignant. It is utterly absurd and foolish to deny that such a disease exists, and if this disease is not rabies it remains for those who deny the existence of rabies to supply another name for it.

Reports on rabies occur in the official health publications of all the Governments of Europe, and the disease is recognized as an exceedingly dangerous one, to be combated most energetically. It was formerly supposed that rabies would develop spontaneously as the result of certain unfavorable conditions, such as confinement, thirst, nervous excitement, stimulant, diet, etc., but it is now demonstrated beyond question that such is not the case, and that the only cause of the disease is direct inoculation from a rabid animal, usually by biting.

On the 23d of March of this year, the British Board of Agriculture issued a far reaching order in reference to this disease, which was deemed necessary on account of the fact that rabies has been increasing for the last few years, and it was thought wise to make an energetic attempt to get rid of it. By this order it was provided that all dogs of Great Britain shall be muzzled, that all animals affected with or suspected of rabies shall be at once reported to the police authorities, and that such information shall be transmitted without delay to the Board of Agriculture. All dogs diseased or which had been bitten by a diseased or suspected dog, are killed. All strange dogs are seized and detained and the importation of dogs from foreign countries is prohibited, excepting when made in accordance with the most stringent provisions. As a result of these new regulations, rabies is rapidly becoming less prevalent, and it is hoped that the disease will be exterminated in England within a comparatively short time. Similar regulations have succeeded in practically eradicating rabies in Ger-

many and in completely extinguishing it in Norway and Sweden, and the future introduction of the disease is prevented by the regulations governing the importation of animals.

On account of the great prevalence of rabies in Columbia and Montour counties last year, and the fact that the appearance of one or two cases led to fear that there would be a repetition of the losses and danger of the previous year, the following regulation was made by the State Live Stock Sanitary Board on June 15, 1897, and posted in numerous places throughout these counties:

"*Whereas*, There is reason to believe that the disease known as rabies, or hydrophobia, exists in the vicinity of Catawissa, and the nature of this disease is such that for the present all dogs, within certain limits, must be suspected of being capable of spreading it, be it

Resolved, By the State Live Stock Sanitary Board, by the authority conferred by the act of May 21, 1895, that all dogs in the counties of Columbia and Montour are hereby declared to be in a state of quarantine, and must be strictly confined or firmly secured on the premises of their owners, and not allowed to run at large or enter public highways, excepting when led or when muzzled with a well fitting muzzle that will affectually prevent biting. This quarantine shall remain in force for 90 days or until removed by the State Live Stock Sanitary Board."

Although the regulation was disregarded in some cases, it was quite generally observed and no cases of rabies, *except in muzzled or confined dogs, which were promptly destroyed*, were reported from either of these counties after the regulation went into effect.

During the past year I have been appealed to by more than one hundred individuals in different parts of the State for advice or action concerning rabies among the different species of domestic animals. To avoid danger, it has been necessary to destroy a number of dogs, cattle, horses and sheep.

As illustrating the symptoms presented by animals suffering with rabies as it has occurred in Pennsylvania, I quote as follows from a letter from a gentleman at Mount Carmel, Pa., who had a very valuable horse taken with what the veterinarian called hydrophobia on January 7, 1897. His first symptoms were pawing, with occasional straining and elevation of the tail. It was thought that he had colic and he was treated for it, but he soon developed other symptoms that led to a change in diagnosis. He became vicious, would lay back his ears and would try to bite the horse in the next stall and repeat this act every few moments. In order to warm him up he was ridden around the town during which it was noticed that he was unusually skittish and nervous. About twenty minutes after his return to the stable he showed more violent symptoms, parted his lips, put back his ears and would jump at any horse or man. At this

time it was thought that he had "fits or staggers," but as he became more vicious it was evident that this was not the trouble. He would strike and bite at anything that came before him; not aimlessly, but apparently with intention to do harm. At this time he breathed very hard, frothed at the mouth and, the owner said, panted like a dog. His eyes protruded and were red. His every appearance was that of an infuriated wild beast and no one dared to venture near. He would jump over the manger, bite, kick and plunge. Fearing that he would escape from the stable, he was shot. The horse had been worked every day and up to the time of the beginning of his illness. Although it was not known that he had been bitten by a mad dog, several had been killed a short time before in that neighborhood. The diagnosis was not confirmed by experimental inoculation.

In April, hydrophobia appeared in a flock of sheep at White Haven, Pa. These sheep were bitten by a strange dog that appeared in the neighborhood on the 7th of April. This dog bit several people, who were promptly treated; seven dogs and seven sheep. Up to date, none of the people who were bitten have developed any disquieting symptoms. Four of the dogs that were bitten went mad before the end of April and were shot and the other three were shot as soon as bitten. Of the sheep, two became exceedingly nervous on Saturday, the 24th of April. It was noticed that they seemed at first restless, alarmed and excitable. Afterwards, they would bite fences and trees and subsequently became vicious and would attack one another. Twenty-four hours after the onset of the disease they were so violent that when a stick was held toward them by a man standing on the other side of the fence, they would rush at it and grasp it in their mouths. The other sheep in the flock became similarly affected until all had died, after passing through the same experience, at periods of from two to four days after the beginning of the attack. The dogs referred to were all killed before they did any damage.

Several cattle were bitten by rabid dogs and developed rabies in the counties of Cumberland, Adams and Huntingdon. In some of these cases the brains from the animals were subjected to laboratory study, and it was demonstrated beyond question that they actually suffered with rabies. I have in my possession reports from nineteen veterinarians in different parts of Pennsylvania in which rabies is described among more than 200 dogs. These reports came from all portions of the State and indicate that this disease is of wider distribution and greater prevalence than has previously been suspected and indicate the urgent necessity of vigilance on the part of all owners of live stock.

The measures that are to be recommended to prevent the dissimination of rabies are the following:

1. All strange dogs should be shot or securely confined, especially if they have the appearance of having traveled a long distance, by showing signs of fatigue, are foot-sore, covered with mud or if they show a sullen disposition, or if the mouth hangs wide open, with the tongue out and covered with dust and the animal is evidently unable to close it, or if the dog shows a disposition to bite.

2. When rabies is known to prevail in a district, the above precautions should be observed with special care, and dogs should not be allowed to run at large excepting under the eyes of their masters.

3. If a dog or other animal has been bitten by a dog that is known to have rabies it should at once be killed.

4. If the biting dog is not known to have rabies, but is suspected of having it, he should be confined, well cared for and kept under observation for a few days. If he has rabies, the disease will develop during this period so that it can be recognized, and if he does not have rabies he can be released as soon as the fact is ascertained. If the biting dog is shot, a post-mortem examination should be held by a veterinarian and, if necessary, experimental inoculations should be made for the purpose of ascertaining whether he was a victim of rabies. If it is ascertained that he was so affected, the animals bitten by him should be killed and, in any case, they should be kept in confinement until positive information on this point is obtained.*

Glanders.

This very dangerous and much-dreaded disease of horses and mules is becoming rarer each year. During the past twelve months, cases have been discovered and killed in the following counties: Allegheny, Beaver, Bedford, Berks, Bucks, Elk, Lackawanna, Lycoming, Montgomery and Philadelphia. Altogether, 21 cases have been disposed of. Four cases, found in three different counties, were traced to a single car load of horses from Nebraska that were sold at auction in a small town near Philadelphia.

Glanders is a contagious disease confined principally to animals of the equine species, but transmissible from them to dogs, cats and man. In every case that I have met with, in which the source of the disease could be ascertained, it was traced to a glandered horse or mule. It was at one time thought that glanders could arise spontaneously, as a result of keeping horses under unhygienic conditions and cases were cited which showed that animals thus kept were frequently exten-

*If the facilities are not at hand for making a thorough examination of a suspected rabid dog that has been shot, the brain will be examined without cost if sent to the Laboratory of the State Live Stock Sanitary Board, 3608 Pine street, Philadelphia. When the brain is submitted for this purpose the head of the animal should be cut off, wrapped in rubber cloth or placed in a water-tight vessel with ice outside, this placed in another water-tight bucket, well covered, and expressed at once. A letter should always accompany such shipments, giving the facts of the case in full.

sively diseased. The keeping of horses in dark, badly ventilated, cellar stables was supposed to be one of the prominent causes of this disease. It was also thought that strangles or colt distemper could develop into this more dangerous and malignant malady. We now know, however, and have the most indisputable proof to show, that glanders cannot develop unless an animal is exposed to the specific germs of this disease. These germs may pass directly from a diseased animal to one that is healthy or their transmission may be indirect; they may be deposited on managers, feed boxes, stall partitions or watering-troughs and thence pass into healthy animals, producing glanders. The period that elapses between the entrance of the germ and the development of the first signs of the disease, known as the period of incubation, is quite variable. It is as short as ten days in some cases, while in others it may be prolonged to several months. The length of this period depends upon the point at which the disease starts and upon its activity. The activity of the disease depends upon the number of germs that are introduced and upon their virulence. Just as some seeds develop into imperfect and unthrifty plants and others into plants that are strong and rugged, some germs of disease have less vitality and strength than others and their effects are not so marked as in the case of germs that are more virulent and strong. The rapidity with which a disease develops depends, also, to some extent upon the condition of its subject.

When the germs of glanders pass deeply into the respiratory tract of a horse, that is, into the back of the nasal passages, the throat, bronchial tubes or lungs and do not lodge in the vicinity of the nostrils, the characteristic changes produced by these organisms are not visible, and this explains the fact that horses sometimes suffer from glanders for a considerable period, and spread the germs of the disease, infecting other horses, before their dangerous condition is recognized.

There was a time, during and following the late war, when glanders was an exceedingly common disease, so common that no horse owner could feel secure, and many valuable animals contracted it and died or had to be killed, even those kept under what seemed to be the most favorable condition.

If all glandered horses were killed and the places occupied by them were disinfected, the disease would become extinct and could never reappear, just as surely as oak trees would become extinct if all acorns were destroyed and just as surely as contagious pleuro-pneumonia of cattle has been exterminated in this country by the destruction of all cattle afflicted with this disease. Ten years ago, contagious pleuro-pneumonia prevailed in several states and there were many who did not hesitate to say that the disease could never be exterminated in America, but results have shown that the disease has been exterm-

inated and not a single case has been found in the United States during the past six years. We are approaching a similar condition in reference to glanders, and I do not hesitate to say that before many years have passed glanders will have been extinguished in the United States. This desirable result will be effected through the continued vigilance of veterinarians and the authorities charged with the control of the diseases of animals in the various parts of the Union.

In suppressing glanders, great assistance is derived from the use of mallein in diagnosing difficult cases. The symptoms of glanders are not always so prominent and characteristic that the disease can be recognized quickly and accurately. It is sometimes difficult to distinguish between cases of glanders and catarrhal conditions of various kinds. In such cases, the doubt can usually be cleared up by the use of mallein.

Mallein is a fluid made from cultures of glanders and is used for the purpose of ascertaining whether horses suffer with glanders or not. The application of mallein, for this purpose, constitutes the mallein test. In performing the test, a small quantity of mallein is injected beneath the skin of the suspected horse. If the animal has glanders, there results a rise of temperature and a local swelling at the point of infection; whereas, if the animal does not suffer with glanders these results were not obtained. While the mallein test is not infallible, its accuracy is quite remarkable and its results, taken in connection with the physical symptoms, usually make it possible to render an accurate diagnosis, without delay.

Whenever glanders is reported in any part of Pennsylvania the matter is investigated at once, and if the report proves to be true the glandered animals are appraised and destroyed and the premises occupied by them are thoroughly disinfected. Glanders is far more common in many states than it is in Pennsylvania, but the dangerous character of the disease is so generally recognized that there is an almost universal disposition to deal with cases of it in the only way that experience has shown to be effectual. More benefit may be expected from the further distribution of information respecting this disease, so that horse owners may be able to guard against it and know that it is necessary to sacrifice its victims, wherever it appears.

It is fortunate that all horses, as well as other animals, coming into the United States from abroad are quarantined and carefully inspected by agents of the United States Bureau of Animal Industry. This prevents contamination from without and as the states suppress the ground that has been gained. The results that have been glanders they are not in danger of losing, from outside contamination, achieved in connection with the suppression of glanders and contagious pleuro-pneumonia and other diseases, should encourage us in our contest with tuberculosis of cattle, cholera of hogs and many

other destructive maladies. While the same methods will not be successful in all cases, the appropriate treatments can be found and, when applied, the results, undoubtedly, will be as gratifying.

Hog Cholera.

This disease has not prevailed so extensively this year as last, but still it has been met with in seventeen counties. Hog cholera outbreaks usually result from the introduction of western hogs that were exposed to the germs of this disease on the farms from whence they come, in the stock yards or in the cars. They often present no symptoms of disease until they are established on the farm of the buyer in this State, when their incipient malady develops, other hogs contract it and an outbreak is started. These occurences develop all through the year, except in winter when they are checked by the cold weather. If an outbreak starts in the spring contagion has opportunity to spread long distances, hence early outbreaks are most disastrous.

When hog cholera appears, the watch words are, isolation and disinfection. In addition, however, the carcasses of the dead animals must be disposed of by deep burial or burning.

At present, the Bureau of Animal Industry has some investigations in progress, through which it is hoped that more effectual means of prevention may be developed. Experiments are also being made with a vaccine to be used in preventing hog cholera. A further discussion of this subject will be found in another part of this volume.

Abnormal (Depraved) Appetite of Cattle.

The disease of cattle that is characterized by a desire to eat abnormal things—things foreign to their normal diet—is one that has received but little attention in this country. In some European countries, on the other hand, this disease has received much study. These facts are accounted for by the comparative rarity in the United States of districts in which this disease exists.

There are but few places in Pennsylvania in which depraved appetite of cattle has been met with and in each the trouble seemed to be of recent origin.

It is a common thing for cattle to lick cold substances or those that have a peculiar taste, and to eat straw in horse manure, and sometimes, especially when there is some slight derangement of digestion, they may show a temporary preference for things apart from their normal food. It is only when these symptoms are pronounced and of long standing and are accompanied by marked loss of condition that this state constitutes a disease. In such cases, the preference for abnormal substances, as manure, coarse fodder, rotten wood, leather, paper, mouldy or decayed hay, grass, etc., is very marked, and to the partial or complete exclusion of other food.

The disease is of slow development and in addition to the characteristic symptom that gives it its name, there is loss of flesh, dry skin, harsh coat, tenderness to pressure along the back, loss of strength and diminished milk production. This affection has been ascribed to various causes, but it is now generally believed to be due largely to some deficiency in the food, and this view is supported by the observation that it is most prevalent on old exhausted farms and in marshy districts where the vegitation is characterized by rank, too luxuriant growth.

For a long time, the treatment of this disease was attended by little success and most of the cases became steadily worse, the animal loosing weight and strength until completely worn out. At present, however, thanks to a German veterinarian there is a remedy at hand by means of which this disease can be successfully treated. It has been shown by Feser and Leurke that apomorphine in doses of from one and one-half to three grains administered sub-cutaneously, each day for three or four days, and a complete change of diet, will effect a cure. This treatment can be carried out very easily and is of great value.

Black Leg.

Black leg, or black quarter, is an infectious disease that is usually rapidly fatal and to which young cattle seem to be predisposed. This disease has been met with in several parts of Pennsylvania during the past year and its distribution is characterized by the same features that have been noted by nearly all of those who have described it elsewhere. Low lands and mountain valleys are the favorite localities for its occurrence and it prevails more frequently on new lands than on farms that have been under cultivation for a long time.

Black leg is caused by a germ which forms a spore that is almost as resistent as that of anthrax. It will endure drying for several years and still retain sufficient vitality to produce disease in animals inoculated with it. It remains alive and virulent in buried carcasses for six months. This germ, or its spore, produces disease when it enters an abraide surface, either of the skin or the membrane of the mouth or throat. No harm results from the mere swallowing of food or water containing the germ if the surfaces over which these substances pass are intact. But as slight abrasions occur so readily and are so obscure, the fact that such an entrance is necessary for the germ is not of high practical importance. In most cases, the entrance is through a slight wound on one of the extremities. The germ from the soil or vegetation passes through this opening and grows beneath the skin and in from one to three days a great, soft swelling is produced. This swelling, which may appear on any part of the body, crackles peculiarly when stroked or pressed. There is high temperature, depres-

sion, loss of appetite and, usually, death occurs in from one to three days after the beginning of the attack.

After death it will be found that the tissue beneath the skin covering the swelling is filled with a mass of yellow or reddish gelatinous material which contains many bubbles of gas. The sub-adjacent muscles are dark red and friable. As distinguishing this disease from anthrax it is important to note that the blood clots and is normal in appearance and the spleen is unchanged.

The treatment for black leg is of little value because the development of the disease is so violent and rapid. It is not quite so severe, however, in cattle over three years of age as in those between the ages of three months and three years, and in aged animals recovery sometimes takes place. If treatment is employed, it should consist in deep scarification and energetic disinfection. But in this case, as in others where disease is under consideration, prevention is far better than cure, and we are fortunate in possessing a vaccine that affords a high degree of security from the attacks of this malady. This vaccine is made in the laboratory by reducing the virulence of the germ, by accurately graduated heat, to such an extent that when introduced beneath the skin of an animal the disease is produced in a mild form, not severe enough to do harm but still sufficient to confer immunity from future attacks.

In some countries, as in Switzerland, where black leg is very prevalent, this vaccination is of the highest value to the live stock interests. In fact it is essential in many districts to its continuation and a large proportion of all young cattle are protected each year.

Vaccination has been practised on a few infected farms in Pennsylvania during the past year and with very encouraging results. No injury has resulted from the treatment and no cases have, thus far, developed among the animals protected. The vaccine for this purpose was obtained from the Bureau of Animal Industry, of the Department of Agriculture, in Washington, where it was prepared under the direction of Dr. D. E. Salmon.

In addition to vaccination, the general precautions recommended in reference to anthrax should be observed.

Tuberculosis.

Inspections of herds have been made upon owner's request in all sections of the State. It has been found that this disease is far more extensive in some places than others, and its prevalence appears to be in direct ratio to the activity of traffic in dairy cows and the age of the dairy industry. Where trade in cows is active, it naturally results that more tuberculous animals are brought into a district than where cattle sales are less common. That is, in two districts there may be, approximately, an equal number of cattle, but different

systems of supplying additions to herds. Tuberculosis is apt to be more prevalent in the locality in which the cows that are used are purchased and brought in from a distance than in the one in which it is the practice of the farmers to rear their own cows. Where the trade in cattle is outward, there is very little tuberculosis; where the principal trade in cattle is inward, there is much tuberculosis, and there is, therefore, more tuberculosis in the old dairy districts than in regions where general farming is practised or where modern dairying is of recent development. This observation is not new and it has been held by some that the conditions are explained by the pressure to which dairy cows are subjected under modern dairy systems, but my observations do not confirm this opinion. I believe that tuberculosis is more prevalent in the localities mentioned for the reason that more tuberculous cattle are brought in and greater facilities are afforded for the distribution of the disease by contact with them, whereas, under the other conditions there is little tuberculosis because it is not introduced from without and cattle trade is so sluggish that it has not been spread rapidly by local tuberculous animals.

That dairies may be conducted on the, so-called, high-pressure plan without detriment to the cows composing them has been demonstrated so frequently that further proof is unnecessary, and that herds may be extensively diseased with tuberculous when they are kept under what are popularly called natural conditions and old-fashioned methods is a matter of every-day observation.

The fact cannot be too strongly impressed that tuberculosis exists in herds because it is introduced from without, and if herds are protected from outside contamination they will not develop tuberculosis on account of any system under which they are kept, or the work that they are required to do, and I know of no case in which there is any reason to believe that a herd became infected with tuberculosis from any other cause than exposure to one or more tuberculous animals or their products. On the other hand, it is true that certain conditions predispose to the development of tuberculosis and lead to its more rapid distribution when it is once introduced. These conditions may be designated predisposing or accessory causes and under this head are classed unhygenic surroundings, improper feeding and breeding, overwork, improper confinement or exposure, etc.

In dealing with tuberculosis of cattle, the plan described in last years' annual report has been contined. Herd inspections are made whenever herd owners apply for them and furnish good reasons for the belief that tuberculosis exists among their cattle. The number of inspections made under these conditions has been limited only by our available resources.

The marked reduction of the percentage of tuberculosis among inspected herds is referred to in the preliminary part of this report.

The most extensive series of inspections have been made in Bradford and Susquehanna counties.

In these counties 4,606 cattle have been tested with tuberculin and 418 tuberculous cattle have been appraised and destroyed. Several very seriously infected herds were found here, but were effectually disposed of and nearly all of the recent inspections have shown a remarkable freedom from tuberculosis. There are many districts in these counties in which no tuberculosis whatever has been discovered, and I believe that at present the Bradford and Susquehanna Co. cattle are free from tuberculosis to a very exceptional degree. The work that has been done in these counties forcibly illustrates the effect of these inspections. Many of the herds that were examined were recently infected, as shown by the history and the fact that but one or two tuberculous cattle were found. The source of contamination could be traced in a large percentage of cases to the introduction of animals that it was afterwards discovered were victims of tuberculosis. The effect of the inspections in these two counties has been not only to destroy 418 cattle than could act as carriers of the disease, but they have also aroused public interest in this question and have placed farmers on their guard, who are now prepared to meet the enemy, for they will be able to recognize it and are acquainted with its tactics. If these inspections had not been made, tuberculosis would have continued in its course and before long these two counties would have been as badly infected as the most seriously diseased centers in the Commonwealth. The business of these counties depends upon the cow to such a great extent that the importance of keeping the herds free from tuberculosis can scarcely be overestimated, a factor that has done much to encourage the inspection of herds. I regret that it has not been possible to comply with all of the requests for herd inspections that have reached us but, as in all other portions of the State, it has been necessary to restrict the examinations to herds that there was good reason to believe were infected with tuberculosis.

All of the tuberculin that has been used for our inspections during the past year has been made by Mr. M. P. Ravenel in the laboratory of the State Live Stock Sanitary Board. It has been, in all respects, as satisfactory as that made anywhere else and results obtained from its use have been remarkable for their accuracy. The 2,510 cows that have been killed have all been examined post mortem. In all cases in which animals were condemned by the use of tuberculin they were found, by this examination, to be affected with tuberculosis, with the exception of one cow killed by one of the agents before the beginning of the year of this report, and in this case the reaction was not characteristic. While one aspect of the accuracy of tuberculin can be subjected

to a final test in this way, there is another phase of its action in regard to which our knowledge is less exact. How many cattle that are actually tuberculous fail to respond to the tuberculin test and show no symptoms of disease and, therefore, remain undiscovered? As there is no opportunity for a post mortem examination of cows that are not condemned, excepting on the rare occasion when it is possible to see them opened by the butcher or to examine them after they have died of injury or other disease, statistics on this side of the question are quite meagre. In some cases a retest of a previously inspected herd has shown a few animals with tuberculosis. Whether these cattle were not detected by the first examination or whether they contracted the disease subsequent thereto must remain an open question, but there is, doubtless, a small percentage of tuberculous cattle that fail to respond to the tuberculin test. Most of these animals do not respond because the disease is so advanced and the animals are so debilitated that their vital powers are reduced and their functions are sluggish. These cases can be detected by physical examination, and as they are thus detected and removed from the herd they do not vitiate the result of the work. The few remaining cases that cannot be detected either by physical examination or tuberculin test are usually of the latent form and therefore not dangerous at the time of examination.

A few years ago tuberculin was objected to by those who had no experience with it on the ground that it might injure healthy cattle. But experience covering thousands of cases, extending over years of time, show that this view is groundless and with the very large number of animals examined with tuberculin in Pennsylvania, *there has not been a report of a single case in which it was even suspected that the test had caused the slightest injury.*

The development of methods to be employed in dealing with this disease will be progressive and it will be our constant endeavor to discover new and more efficient measures that may be employed with advantage and economy.

In this connection, the provisions of the act of June 20, 1897, are being availed of and an extensive series of experiments is planned and under way for the purpose of throwing additional light on some of the obscure features of the tuberculosis question.

It is to be our especial aim to gather facts bearing on the influence of sanitary conditions on the distribution of tuberculosis and predisposition to it; the infectiousness of milk under special known conditions; the influence of light on the germ and its growth in the animal and the value of treatment with tuberculin or other agents.

Infectious Abortion of Cattle.

As an extensive article on this disease appears in another part of this report, it is unnecessary to discuss it in detail here. Numerous

outbreaks of infectious abortion have been met with during the past year, and it is evident that enormus losses result to dairymen from the prevalence of this disease.

A full description of its cause and the means to be employed, in the light of our present knowledge, to prevent it are given elsewhere, and it only remains to emphasize the fact that this is a contagious disease and the directions given as to isolation and disinfection can not be followed too rigidly.

Catarrhal or Broncho-Pneumonia of Cattle.*

The study of this disease, commenced last year, has been continued and it has been seen in several herds during the autumn. On October 16, Mr. ————, of Huntingdon county, applied for an inspection of his herd and expressed the belief that his cattle were afflicted with tuberculosis. It seems that he had purchased seven yearlings in Centre county that appeared healthy when they were bought, but shortly after they reached his farm they developed a severe cough, lost condition, became emaciated and four died. Subsquently, some other young cattle on his farm developed similar symptoms, leading to the belief that the affection was contagious and tuberculosis was suspected. The herd, consisting of seventeen animals, was tested with tuberculin by Dr. Louis A. Klein, of Lewistown, on November 1, with the following result:

* Through an error in copying, a reference was made in my report of last year to Croupous Pneumonia of Cattle, whereas Catarrhal Pneumonia was intended.

No.	Description.	Age.	Temperatures Before Injection. Date: November 1, 1897. Time: 4 p. m.	Time: 6 p. m.	Time: 8 p. m.	Date: November 1, 1897. Dose of tuberculin solution.	Time of injection.	Temperatures After Injection.. Date: November 2, 1897. Time: 6 a. m.	Time: 9 a. m.	Time: 11 a. m.	Time: 1 p. m.	Time: 3 p. m.	Time: 4 p. m.
1	Grade cow,	9,	101.9	101.6	101.8	dr. i.	9 p. m., .	101.6	101.6	101.5	101	.....	.....
2	Grade cow,	4,	101.8	102.1	102.2	"	9 p. m., .	102.2	101.7	101.5	102.1	101.8	.....
3	Jersey cow,	7,	102.1	101.6	101.2	"	9 p. m., .	101.1	101.4	101.4	101.4	101.3	.....
4	Grade cow,	5,	102.4	101.7	101.8	"	9 p. m., .	101.5	101.7	101.8	101.5	101.5	.....
5	Grade cow,	3,	102.3	101.9	101.8	"	9 p. m., .	101.2	101.6	101.3	101.2	101.1	.....
6	Grade cow,	7,	102.1	102.2	101.7	"	9 p. m., .	102.2	102	101.7	101.6	101.7	101.3
7	Grade steer,	1½,	102.2	102.3	103.2	"	9 p. m., .	101.6	101.2	101.8	101.8	101.6	101.8
8	Grade steer,	1½,	102	102.2	102.5	"	9 p. m., .	101.7	101.2	102	101.4	101.3	.....
9	Grade bull,	2½,	101.2	102	100.4	"	9 p. m., .	102.3	101.7	101.6	101.3	.....	.....
10	Grade heifer,	2,	102.6	102.6	102.4	"	9 p. m., .	101.4	101.5	101.5	101.5	101.3	.....
11	Bull calf,	8 mos.,..	102	101.8	101.6	m. xl.,	9 p. m., .	101.2	101.2	101.5	101.2	102	101.9
12	Bull calf,	6 mos.,..	103.7	102.8	102.7	m. xl.,	9 p. m., .	102.2	102.3	101.4	101.5	102.4	102.4
13	Heifer calf,	8 mos.,..	103.7	103.1	102.5	m. xl.,	9 p. m., .	102.4	102.9	102.3	102	102.4	102.4
14	Heifer calf,	4 mos.,..	103.5	102.6	102.4	m. xl.,	9 p. m., .	102.2	102.5	102.4	102.4	102.6	102.3
15	Bull calf,	10 mos.,..	103.3	102.6	102.8	m. xl.,	9 p. m., .	102.4	102.7	102.4	102.6	102.3	.....
16	Bull calf,	7 mos.,..	103.3	103.4	102.5	m. xl.,	9 p. m., .	102.4	102.1	102.6	101.9	102.3	102.2
17	Heifer calf,	7 mos.,..	103.1	102.4	102.3	m. xl.,	9 p. m., .	102.1	102.3	102.5	102.2	102.4	102.6

It will be noticed that there is no indication of tuberculosis in any of the animals so far as the temperatures are concerned. The affection was, however, so indefinite that one of the heifers was purchased and killed, a careful post mortem examination being made. Some of the tissues were sent to the laboratory of the State Live Stock Sanitary Board for study. The examination of the lung showed that the anterior lobes of both of them were dark red in color, solidified and heavy and upon cross section there appeared numerous small cavities containing yellowish cheesy pus. The bronchial tubes contained frothy mucous and their lining membrane was thickened. The connective tissue stripes separating the lobules were infiltrated with serum and thickened. The pleura was smooth and quite normal. The lymphatic glands were normal and all of the other organs were normal in appearance, although somewhat pale.

On November 10 the herd belonging to Mr. ————, of Mifflin county, was tested by Dr. Klein, with the following result:

No.	Description.	Age.	Temperatures Before Injection. Date: November 10, 1897. Time: 3 p. m.	Temperatures Before Injection. Date: November 10, 1897. Time: 5.45 p. m.	Date: November 10. Dose of tuberculin solution.	Date: November 10. Time of injection.	Temperatures After Injection. Date: November 11, 1897. Time: 4.30 a. m.	Time: 7.30 a. m.	Time: 10.30 a. m.	Time: 1 p. m.
1	Daisy Jersey Grade,	4,	102.5	102.2	*,	7.30 p. m.,	101.5	102	102.1	102.1
2	Holstein grade cow,	4,	101.7	101.4	*,	7.30 p. m.,	100.9	101.3	101.9	101.9
3	Holstein grade cow,	6,	101.1	101.4	*,	7.30 p. m.,	101	101.4	101.1	.....
4	Jersey grade cow,	5,	101.6	101.7	*,	7.30 p. m.,	101.2	101.7	101.6	.....
5	Grade heifer,	2,	101.7	101.6	*,	7.30 p. m.,	101	101.5	101.2	.....
6	Grade heifer,	2,	101.5	101.4	*,	7.30 p. m.,	101.5	101.2	101.4	101.2
7	Holstein grade heifer,	2,	101.8	101.7	*,	7.30 p. m.,	101.1	101.7	101.9	101.9
8	Jersey heifer,	2,	101.2	101.2	*,	7.30 p. m.,	101.1	101.2	101.3	101.5
9	Grade heifer,	2,	102.6	102.5	*,	7.30 p. m.,	102.1	102.4	102.4	.....
10	Holstein grade heifer,	2,	101.5	102.2	*,	7.30 p. m.,	102	102.2	101.8	.....
11	Grade heifer,	2,	102.4	102.4	*,	7.30 p. m.,	101.8	102.3	101.9	.....
12	Jersey grade heifer,	2,	101.4	102	*,	7.30 p. m.,	102.1	101.7	101.8	102
13	Holstein grade bull,	2,	103.2	103.5	*,	7.30 p. m.,	102.4	102.4	102.5	102.3
14	Grade heifer,	1½,	101.5	101.7	*,	7.30 p. m.,	101.6	101.9	101.7	.....
15	Jersey grade heifer,	2,	102.2	102.2	*,	7.30 p. m.,	101.8	102.3	101.7	.....
16	Grade heifer,	2,	101.8	101.6	*,	7.30 p. m.,	101.5	102	101.8	.....
17	Heifer calf, grade,	3 mos.,	102	102.4	m. xl.,	7.30 p. m.,	101.9	102.6	102.4	.....
18	Heifer calf, grade,	3 mos.,	102.4	102.9	m. xl.,	7.30 p. m.,	101.9	102	102.1	102.7
19	Grade steer,	2,	101.1	101.6	*,	7.30 p. m.,	99.1	100.4	100.6	100.6
20	Grade steer,	2,	101.4	101.4	*,	7.30 p. m.,	101.6	101.3	101.6	101.9
21	Grade bull,	2,	101.8	102.2	*,	7.30 p. m.,	101	99.3	99.1	.....
22	Grade steer,	2,	101	101	*,	7.30 p. m.,	100.4	101.8	100.9	.....
23	Grade heifer,	2,	101.8	102.1	*,	7.30 p. m.,	101.7	101.8	101.8	101.6
24	Grade heifer,	2,	101.8	101.2	*,	7.30 p. m.,	101	101.5	101.9	101.5
25	Holstein grade steer,	2,	102	102.2	*,	7.30 p. m.,	100.4	101.4	101.4	.....
26	Grade heifer,	1½,	101.9	101.8	*,	7.30 p. m.,	102	101.5	101.7	101.4
27	Grade steer,	10 mos.,	100.7	100.5	m. l.,	7.30 p. m.,	102.2	101.1	101.3	102.1
28	Grade steer,	10 mos.,	102.8	101.4	m. l.,	7.30 p. m.,	101.1	101.8	102.5	102.5
29	Grade steer,	10 mos.,	102.6	101.2	m. l.,	7.30 p. m.,	101.9	101.5	101.6	101.7
30	Grade steer,	10 mos.,	102.1	101.8	m. l.,	7.30 p. m.,	101.1	102.3	102.4	102.2

31	Grade heifer,	10 mos.	102.2	102.2	m. l.,	7.30 p. m.,	101.8	100.3	102.3	102.5
32	Grade heifer,	10 mos.	102	101.9	m. l.,	7.30 p. m.,	101.7	102.6	102.5	.....
33	Grade bull,	10 mos.,	102.1	102.4	m. l.,	7.30 p. m.,	102.2	102.2	102.1	.....
34	Grade bull,	10 mos.,	101.7	101.8	m. l.,	7.30 p. m.,	102.4	102	102.2	102.2
35	Grade steer,	14 mos.,	102.1	102.1	m. lv.,	7.30 p. m.,	101.7	102.2	102.7	102.2
36	Grade steer,	10 mos.	101.2	100.9	m. l.,	7.30 p. m.,	101.1	102.5	102.2	102.2
37	Grade heifer,	8 mos.,	101.9	101.9	m. xlv.,	7.30 p. m.,	101.3	101.6	101.8	101.6
38	Grade steer,	15 mos.	101.4	102.2	m. lv.,	7.30 p. m.,	101.9	102.5	102.8	102.8
39	Grade steer,	10 mos.	101.7	101.9	m. l.,	7.30 p. m.,	101.9	102.3	102.9	101.3
40	Grade bull,	10 mos.	101.6	100.8	m. l.,	7.30 p. m.,	101.7	100.6	101.6	100.6
41	Grade heifer,	10 mos.	102.4	102.6	m. l.,	7.30 p. m.,	101.5	102.1	102.1	.....
42	Grade heifer,	8 mos.,	101.6	101.4	m. xlv.,	7.30 p. m.,	101.9	100.5	102.5	102.5
43	Grade bull,	10 mos.,	102.1	101.8	m. l.,	7.30 p. m.,	101.2	100.8	101.6	102.2
44	Holstein grade cow,	6.	101.4	100.9	*,	7.30 p. m.,	101.1	101.2	101.6	101.6

Indicating that none of the cattle were tuberculous. A history of the herd showed that one of the cows had been coughing for about two years and had recently been falling off in condition, although her appetite had continued good. About three months before the examination the cow standing next to her in the stable, and about a month later, the next two developed the same symptoms. At the time of the test, most of the cattle had the same cough, but with few exceptions had not lost condition. For the sake of ascertaining further the character of the disease, one of the cows was purchased from Mr. ——— and destroyed. The post mortem examination revealed red and solid areas in the posterior part of the cephalic lobe, nearly all of the middle lobe and the anterior part of the caudal lobe in each lung. A cross section revealed interlobular infiltration of serum and small areas of caseation and froth in the tubes. One cow from this herd that had been coughing for two months was subsequently killed for beef and a similar condition was found to exist in her lungs.

The owner of the herd was of the opinion that the cow first killed was the source of all the trouble in this herd. He said that the young cattle had not begun to cough until after she had been among them, and that the cattle in the neighborhood which seemed to be affected in the same way were in herds with which this cow came in contact. The people in the vicinity of these herds were alarmed lest their cattle should become infected with the same disease, and in some cases asked for the appraisal and destruction of the affected cattle as has been done in outbreaks of pleuro-pneumonia and tuberculosis, but as it was not clear whether the difficulty arose from local causes or whether it was actually spread by contact with diseased animals, the precaution was taken to advise the careful isolation of the diseased animals until this question could be decided. In December two calves were purchased from Mr. X, and at this time a careful study is in progress with a view of solving this question. Two healthy calves are being exposed in a way as will probably show whether the disease is contagious. Similar appearances of this disease have been reported elsewhere in the mountainous portions of the State.

A careful bacteriological examination was made in four cases by Dr. M. P. Ravanel, with negative results thus far. The lung tissues seemed to be quite sterile. Guinea pigs were inoculated with some of the morbid material from the lungs with no effect. This work excludes the two best known contagious diseases in which the lungs are involved, lung plague and consumption, but has not, as yet, revealed the cause of the present malady.

Although this disease was referred to in the last annual report, but little opportunity has occurred for the continuation of the study commenced a year ago, because no further accounts of its presence were received until about two months ago. It is confidently expected that

the present investigation will place us in a position to determine with accuracy the importance of this disease, and to formulate measures for meeting the new dangers that may accompany it. It has been recognized in several localities quite recently and the need of further information concerning it is becoming more apparent. This is being gathered rapidly.

Anthrax.

As anthrax has been met with in several widely separated portions of the Commonwealth during the past season and as the disease is a very virulent and dangerous one, I include herewith a brief description of it as a preliminary to a report on the outbreaks with which we have had to deal.

Anthrax is a disease of great antiquity and has at times caused enormous losses in European countries dating from the beginning of historic times to the present day. In some countries, it has on occasions almost exterminated the farm live stock. In other places, it prevails constantly to such an extent that until preventive vaccination was discovered by Pasteur the raising of live stock was an unprofitable occupation. The disease may occur in any of the warm blooded animals, but cattle and sheep are most susceptible to it, although during the past season several cases have been reported in Pennsylvania in horses, swine and men. Anthrax is caused by a bacillus which is found after death in great numbers in the blood, spleen, liver, and in fact, in practically all parts of the body. In most cases, this germ enters the animal from the soil; it reaches the soil from the body of an animal that has died of the disease. After the germ escapes from the body of an anthrax subject it developes a spore which is an enduring form of the germ and may be compared to the seed of a higher plant. This spore is characterized by its great and exceptional resistance to unfavorable conditions. It is not destroyed by freezing or by the highest natural temperatures that occur in this climate. During the summer months it will multiply in the soil, and in this way the poison of anthrax may be continued, in a contaminated soil, for a period of several years. When susceptible cattle graze in such a region, or drink the water that drains from soil contaminated in this manner, or inhale the dust arising from the dried vegetation from such a soil, the spores of anthrax that are thus carried into the body develop anthrax bacteria which produce this deadly disease. In some cases, the infection occurs through a wound in the skin. After the germs enter the body they multiply with great rapidity and frequently produce death within twenty-four hours, and sometimes in a shorter period. In other cases, the course of the disease may be prolonged to several days and, rarely, an animal may recover. In the very exceptional cases in which animals recover from

anthrax, it is found that thereafter they possess a marked degree of immunity from the disease and do not contract it as other cattle usually do when exposed.

The principal symptoms of anthrax are the high fever ranging from 104 degrees to 107 degrees F., red mucous membranes, rapid, bounding pulse; depression and prostration shown by loss of appetite, disinclination to move about with the herd and weakness that is indicated by an irregular gait and staggering. The faeces are sometimes coated with blood and sometimes there is a bloody discharge from the nostrils. When the infection takes place through the skin there is a local swelling at the point of inoculation. After death the carcass bloats quickly and if it is cut into it will be found that the blood is not firmly clotted, but is of a thick-fluid consistency and of an abnormally dark color. The internal organs are more or less engorged with this dark blood, the liver is friable, somewhat enlarged, and the spleen is usually greatly swollen and softened.

Whenever anthrax appears, it is important to so dispose of the carcasses of its victims that the soil may not become contaminated with its germs. This is best accomplished by burning the carcasses without opening them, because wherever a drop of blood falls the seeds of the disease may become established. If possible, the carcass should be burned on the spot where the animal dies. If this cannot be done on account of the surroundings the carcass should be loaded on to a stone boat and dragged to a suitable place, there thrown upon a loose pile of wood and cremated. If burning is not possible, the next best method of disposing of these carcasses is to bury them deeply away from water courses (where they would drain into a stream and might be washed out) and covered well with lime before the earth is thrown over them. Such graves should be so deep that there will be no danger of future accidental disinterment. If the animal dies in the stable the premises occupied by it should be cleaned in the most thorough manner and disinfected by a thorough washing and saturation with a solution of bichloride of mercury (corrosive sublimate) 1 part to 1,000 parts of water. As this solution is poisonous it must be used with care.

The germs of anthrax prefer low moist soils and remain alive longest in such places. The infection of the soil of a given region with the germs of anthrax is a serious matter and endangers the live stock for a considerable period thereafter.

During the past year, the outbreaks of anthrax that have been met with have occurred in Cumberland, Jefferson, Lancaster, Lycoming, Tioga and Warren counties. Most of these outbreaks evidently occurred from exposure on soils or in localities that had previously been infected and did not present points that render them unusual or exceptional in character. Two of the outbreaks, however, may be des-

ignated primary or original outbreaks and occurred in districts where there was no previous history of infection. In the cases of the first class, advice was given and measures were taken looking to the proper disposition of carcasses as recommended above. It has been recommended in several cases to drain and thoroughly lime fields that are known to be infected with the germs of anthrax. If such soils can be allowed to lie fallow for a year or two or can be planted in timber it is best to do so, for it is not strictly safe to use them for the growing of any food or fodder crop. If, however, they are used for the growing of grain it is probable that corn constitutes the safest crop, but in harvesting the corn it should be cut high, not less than two feet from the ground.

Animals can be reared in permanently infected districts and on permanently infected farms and fields if they are protected by vaccination. This protection is conferred by putting the animal through a mild course of the disease. The vaccines used for this purpose are attenuated cultures of the germs of anthrax that have been weakened and reduced, by laboratory methods, to such an extent that they cannot kill an animal or even cause disease in a dangerous form. Two vaccines are used: The first is quite weak and after the animal is thoroughly recovered from its effects it is vaccinated again with the stronger one. The first vaccine protects the animal to such an extent that the second is borne without difficulty. If the second, or stronger, vaccine were used first its effect would be so violent that the animal would be injured and possibly killed. In using anthrax vaccine it is necessary first of all to know that they have been carefully and accurately prepared and that they are in good condition at the time of use. It is also necessary to administer them with great caution and accuracy. Even when every precaution is observed there is a small element of risk that cannot be avoided, hence vaccination against anthrax is not used excepting when the conditions that give rise to the disease cannot be removed. It is very much better to prevent the infection of the soil and thus avoid the necessity for using the protective inoculations.

The two outbreaks of the second class, that have been referred to as primary or original outbreaks, occurred in Jefferson and Lycoming counties. In July, a letter was received from Falls Creek in which it was reported that eleven head of cattle had died during ten days, and that it was supposed that they had been killed by poison in the water that they drank. Part of this water came from a tannery that was at the time working on hides that were said to be heavily impregnated with arsenic and arsenical poisoning was suspected. The matter was at once investigated and it was found that the cattle had died as reported, but the report was so late that before any material

could be obtained for examination it was in an advanced state of decomposition and this made it impossible to obtain satisfactory results. But no traces of arsenic were found. In August, Dr. F. A. Hamilton, veterinarian, of Dubois, Pa., was asked to act as agent for the State Live Stock Sanitary Board and gather all possible information in reference to the diseased cattle. No more animals died from which fresh material for examination could be obtained until September 16, when a cow died at Reynoldsville eight miles below Falls Creek. This animal was examined post mortem by Dr. F. F. Hoffman of Brookville, September 18. He found the carcass puffy and putrid, the blood fluid and very dark, the lungs mottled and congested, the spleen 26 inches long, from 7 to 9 inches wide, 3 inches thick and quite friable. The liver was congested, enlarged and friable and the intestines were thickened, dark and soft. The carcass was burned. Some specimens from this animal were forwarded to the laboratory of the State Live Stock Sanitary Board and the germs of anthrax were isolated from them. Upon the receipt of this report, which was on the 19th of September, I at once visited Reynoldsville, Falls Creek and vicinity.

All of the sudden deaths among cattle occurred in animals pasturing along the course of the Falls Creek and Red Bank Creek within eight miles of the Falls Creek tannery. The drainage of this tannery is discharged into Falls Creek and at the time of the original fatalities among cattle and for some weeks thereafter the tannery was working on hides from China, which were imported through New York. It was claimed that these hides were strongly impregnated with arsenic and that for a time from one to two-hundred pounds of arsenic were discharged into the creek each day. It was not possible to ascertain, however, that this statement was true. During July and August, four workmen in the tannery at Falls Creek died of a rapidly fatal disease that was diagnosed by Dr. J. C. Booher an anthrax and two other men suffered with local infectious diagnosed as local anthrax or malignant carbuncles. After these cases developed the tannery was cleaned up and disinfected as thoroughly as possible and work on the Asiatic hides had ceased at the time of my visit.

So far as I know, the only bacteriological diagnosis that was made during this outbreak, in which the germ was carried through the necessary culture and inoculation tests, were made under the auspices of this Board, but Dr. Hoffman saw long rod shaped bacilli in the tissues examined. In the light of this work, and the diagnosis of Dr. Booher and the symptoms described by those who saw the diseased cattle it would appear that there is but little doubt that most of the animals that died suddenly in that vicinity during the summer of diseases that were looked upon as mysterious were really victims of anthrax. The losses of cattle amounted to from twenty-five to thirty head. Many

of these animals were ranging in the woods and the exact time of death was not known. In fact, it was not known that some of them were dead until their putrefying remains were discovered in the underbrush. At the time of my visit arrangements were made for a thorough search for carcasses through the pasture of that region, and provision was made for the destruction of such carcasses and remains of carcasses in a very thorough manner. In each case a fire was built over and around the dead body, thus thoroughly heating and sterilizing it. Afterwards the spot was well covered with lime, and stones or stumps were piled over it in such a way that no large animals could gain access to it. This work was efficiently performed for the State Live Stock Sanitary Board under the direction of Dr. Hamilton. The results of this work will not be apparent until next summer.

I also arranged for the prompt cremation of the carcass of every animal that should die of anthrax in the future. It is to be hoped that this thorough treatment of the carcasses has prevented a widespread infection of the soil, but the danger of continued infection resulting from the deposition of anthrax spores from the tannery along the banks of the stream below it must be considered and it is possible that future losses may result from this source. With a view of preventing, also, the further distribution of the germs of anthrax by animals it is proposed, during the coming spring, to vaccinate and protect the cattle kept on the low ground along this water course in the possibly infected area.

The other case of a similar character occurred in Lycoming county and is reported upon as follows by Dr. M. P. Ravenel, bacteriologist:

PHILADELPHIA, PA., December 14, 1897.

DR. LEONARD PEARSON, State Veterinarian:

Dear Sir: In accordance with your instructions to investigate the outbreak of anthrax at the Proctor tannery, for the purpose of ascertaining whether the cattle of that vicinity were endangered, I left Philadelphia on the evening of December 9th and reached Proctor at about noon on December 10th. Every facility was afforded me by the superintendent of the tannery, who gave me all the information in his power. In my examination of the premises I was accompanied and assisted by Dr. Gamble, one of the physicians in attendance on the case of anthrax now at Proctor. The tannery has been in operation for a number of years, and is now under the control of the Elk Tanning Company, which latter is under control of the United States Leather Company. The tannery is quite a large one, employing from sixty to seventy men. It is situated on Plunkett's creek, which empties into Loyal Lock, which in turn empties into the Susquehanna river at Montoursville. The refuse from the tannery is carried into Plunkett's creek.

I found the operatives were considerably excited over the cases of anthrax which have occurred lately, three in number, two of which have resulted fatally, while the third gave indications of the same termination. The origin of these cases is attributed by every one to the working up of hides imported from China, and the evidence that such was the case seemed to me conclusive. I was not able to get one of these hides in the raw state for bacteriological examination, as the last of them had been put into the bark solution, which seems to end the danger of the infection. I was told that all cases had occurred in men who handled them previous to this operation, and such would seem to be the case.

Among the operatives, these hides from China are generally considered to be animals dying of disease, and are known technically as "murrain" hides. They claim to be able to tell a murrain hide without fail, both by the appearance of it, and by its refusing to "plump up" during the working up of it. The superintendent did not share this opinion, but believed that a certain proportion of the hides was from slaughtered animals while others were from those dying from disease. All were bundled together without distinction, for shipment. He doubted also whether it was possible to tell certainly which was which, though he did not deny that it could be done. About June a year ago some ten head of cattle died about the tannery, the result, it is claimed, of drinking water containing refuse from the beam-room. No veterinarian examined them and no positive diagnosis can be given though it is believed by many that the cause of death was anthrax. This happened just after the opening up of the tannery on these hides from China. The deaths ceased on the fencing off of the water. I could not hear of any deaths down the stream among cattle. At any rate, the danger is now over, as the lot of hides is now exhausted. These hides are said to be a part of the same cargo which caused the death of four men and a number of cattle at and about Falls Creek in July and August last. This seems to be well authenticated, and is admitted, I was told, by the company operating the tannery.

No bacteriological examination was made in either of the two fatal cases of anthrax occurring at Proctor, the diagnosis resting solely on the symptoms. I made cultures from several points on the arm of the case under treatment then at Proctor, including the tissues about the site of the original pustule. From these I have obtained cultures of the anthrax bacillus, which proved fatal to guinea pigs on the third day, the organism being recovered from the blood and organs of the animal.

There is another tannery operated by the Elk Tanning Company situated at Ralston, some sixteen miles from Proctor. This plant is larger than the one at Proctor, and its refuse is poured into Lycoming

creek. The tannery is working hides said to be of the same cargo as those at Proctor. The superintendent, Mr. Woodworth, told me tha some twenty-four cases of anthrax had developed among the operatives, the diagnosis being based entirely on the symptoms, no bacteriological examinations having been made. I learn from others that three fatal cases had occurred, but this I was not able to confirm. It is certain that at least one fatal case occurred there. There had been five cases recently, all of which ended in recovery. About one year ago all the fish down the stream for some distance died, and could be picked up on the banks or in the small springs along the shore, where they seemed to go in search of pure water. The death of the fish is attributed to refuse of the tannery at Ralston. During the past summer ten or twelve head of cattle have died along the stream. Six died at Bodine, four miles below the tannery, within one month's time. They were supposed at the time to be poisoned. Only one was examined by a veterinarian, so far as I could learn. Death in the cattle took place as far down the stream as Trout Run, ten miles below the tannery. Specimens from one of these cattle were examined on September 8th, but I failed to find the anthrax bacillus. The symptoms of many of the cattle, as described to me, resembled anthrax very closely.

In the time at my disposal, I was not able to verify all the statements made to me by different parties, but I have endeavored to give what appeared to me to be well substantiated facts.

Bacteriological examination of the case at Proctor at the time of my visit leaves no doubt as to the nature of the disease. Bacteriological examination of the tissues of one of the cows which died at Falls Creek in September last also proved the disease to have been anthrax beyond question.

All of which is respectfully submitted,

MAYZCK P. RAVENEL, M. D.,

Bacteriologist of the State Live Stock Sanitary Board.

These two outbreaks illustrate one of the important ways in which anthrax is carried long distances. Unfortunately, there appears to be no simple way by which we can protect ourselves from the danger resulting from the use of such infected hides. No method has yet been discovered for the safe, efficient and economical disinfection of hides, and although attempts have been made upon the part of the Federal Government to plan and enforce such disinfections in the case of hides from suspected sources, they appear to have been evaded in a few cases. It seems that in some partly civilized countries the hides are removed from animals that die of anthrax and are exported. There is a provision against the importation of hides from districts

where anthrax is known to exist, but as the hides do not always come directly from such districts the regulation does not fully prevent their importation. It has been shown by Griglio, an Italian investigator, that the spores of the anthrax baccillus are even more resistent than is usually supposed and that the usual, so-called, disinfection to which wool and hair and hides are sometimes submitted is futile. He has found that the salting of hides and steeping of the skins in brine does not destroy the spore, nor does soaking of the dried hides in milk of lime, nor prolonged drying, and other observers have noticed that treatment even with arsenic does not disinfect the skins. One reason for this may lie in the fact that spores exist not only on the surface of the skin, but in the deeper parts, whither they are carried in the circulation.

It is to be hoped that in the future reports of outbreaks of anthrax, or of any rapidly fatal and suspicious disease among cattle, will be reported promptly to the State Live Stock Sanitary Board so that in case it should be found that this disease exists the proper measures can be taken at once and the permanent infection of new localities can thus be prevented.

The demand for anthrax vaccine seems to be increasing, but provision has been made for producing a sufficient supply in the laboratory to meet all probable needs.

With continued careful oversight of the localities in which anthrax has developed, the proper disposition of all suspected carcasses and a judicious use of vaccine, there is every reason to believe that the disease can not only be kept within present bounds, but that it will, in time, be suppressed.

Respectfully submitted,

LEONARD PEARSON,

State Veterinarian.